

He 03104107

REPORT NUMBER: 2011U-VER-03-03

**SAFETY COMPLIANCE TESTING FOR FMVSS 201  
OCCUPANT PROTECTION IN INTERIOR IMPACT  
UPPER INTERIOR HEAD IMPACT PROTECTION**

**HYUNDAI MOTOR COMPANY  
2003 HYUNDAI ELANTRA 4-DOOR SEDAN**

NIHTSA NUMBER: C30503

VERIDIAN TEST NUMBER: 8653-FMH-08

VERIDIAN ENGINEERING  
TRANSPORTATION SCIENCES CENTER  
P.O. BOX 400  
BUFFALO, NEW YORK 14225



Date: January 17, 2003

FINAL REPORT

PREPARED FOR:

U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Safety Assurance  
Office of Vehicle Safety Compliance  
Mail Code: NVS-220, Room 6111  
400 Seventh Street, SW  
Washington, DC 20590

This publication is distributed by the U. S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by:

James A. Czarniecki  
James Czarniecki, Project Engineer

Approved by:

David J. Traval  
David J. Traval, Program Manager  
Transportation Science Center

Approval Date:

March 18, 2002

FINAL REPORT ACCEPTANCE BY OVSC:

K. W. W. W.  
Accepted By

5-27-2003

Date of Report Acceptance

# **TECHNICAL REPORT STANDARD TITLE PAGE**

|                                                                                                                                                                                                                                                                                                                             |  |                                                             |  |                                                                                                                                                                                                                                                    |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1. <i>Report No.</i><br>201U-VER-03-03                                                                                                                                                                                                                                                                                      |  | 2. <i>Government Accession No.</i>                          |  | 3. <i>Recipient's Catalog No.</i>                                                                                                                                                                                                                  |  |
| 4. <i>Title and Subtitle</i><br>Final Report of FMVSS 201 Compliance Testing of a<br>2003 Hyundai Elantra 4-door Sedan<br>NHTSA No. C30503                                                                                                                                                                                  |  |                                                             |  | 5. <i>Report Date</i><br>January 17, 2003                                                                                                                                                                                                          |  |
|                                                                                                                                                                                                                                                                                                                             |  |                                                             |  | 6. <i>Performing Organization Code</i><br>VER                                                                                                                                                                                                      |  |
| 7. <i>Author(s)</i><br>Jim Czarnecki, Project Engineer<br>David J. Travale, Program Manager                                                                                                                                                                                                                                 |  |                                                             |  | 8. <i>Performing Organization Report No.</i><br>8653-FMH-08                                                                                                                                                                                        |  |
| 9. <i>Performing Organization Name and Address</i><br>Veridian Engineering<br>4455 Genesee Street<br>Buffalo, New York 14225                                                                                                                                                                                                |  |                                                             |  | 10. <i>Work Unit No.</i>                                                                                                                                                                                                                           |  |
|                                                                                                                                                                                                                                                                                                                             |  |                                                             |  | 11. <i>Contract or Grant No.</i><br>DTNH22-99-C-01005                                                                                                                                                                                              |  |
| 12. <i>Sponsoring Agency Name and Address</i><br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Safety Assurance<br>Office of Vehicle Safety Compliance<br>Mail Code: NVS-220<br>400 Seventh St., SW, Room 6111<br>Washington, D.C. 20590                                           |  |                                                             |  | 13. <i>Type of Report and Period Covered</i><br>Final Report<br>January 2003                                                                                                                                                                       |  |
|                                                                                                                                                                                                                                                                                                                             |  |                                                             |  | 14. <i>Sponsoring Agency Code</i><br>NVS-220                                                                                                                                                                                                       |  |
| 15. <i>Supplementary Notes</i>                                                                                                                                                                                                                                                                                              |  |                                                             |  |                                                                                                                                                                                                                                                    |  |
| 16. <i>Abstract</i><br><br>Compliance tests were conducted on the subject vehicle, a 2003 Hyundai Elantra 4-door Sedan in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure TP-201U-01 for determination of FMVSS 201 compliance. Test failures identified were as follows: None |  |                                                             |  |                                                                                                                                                                                                                                                    |  |
| 17. <i>Key Words</i><br>Compliance Testing<br>Safety Engineering<br>FMVSS 201U                                                                                                                                                                                                                                              |  |                                                             |  | 18. <i>Distribution Statement</i><br><u>Copies of this report are available from:</u><br>NHTSA Technical Information Services (TIS)<br>Mail Code: NPO-230<br>400 Seventh St., SW, Room 5108<br>Washington, DC 20590<br>Telephone No.: 202-366-4946 |  |
| 19. <i>Security Classif. (of this report)</i><br>UNCLASSIFIED                                                                                                                                                                                                                                                               |  | 20. <i>Security Classif. (of this page)</i><br>UNCLASSIFIED |  | 21. <i>No. of Pages</i>                                                                                                                                                                                                                            |  |
|                                                                                                                                                                                                                                                                                                                             |  |                                                             |  | 22. <i>Price</i>                                                                                                                                                                                                                                   |  |

Form DOT F1700.7 (8-69)

## TABLE OF CONTENTS

| <u>Section</u> |                                                                                                                              | <u>Page No.</u> |
|----------------|------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1              | PURPOSE AND TEST PROCEDURE                                                                                                   | i-1             |
| 2              | SUMMARY OF UPPER INTERIOR HEAD IMPACTS                                                                                       | 2-1             |
| 3              | SUMMARY OF TEST RESULTS AND DATA PLOTS                                                                                       | 3-1             |
| APPENDIX A     | PHOTOGRAPHS                                                                                                                  | A-1             |
| APPENDIX B     | PART 572L PERFORMANCE CALIBRATION IN SUPPORT OF VEHICLE SAFETY COMPLIANCE TESTING FOR OCCUPANT PROTECTION IN INTERIOR IMPACT | B-1             |

## LIST OF DATA SHEETS

| <u>DATA SHEET</u> | <u>DESCRIPTION</u>                          | <u>PAGE NO.</u> |
|-------------------|---------------------------------------------|-----------------|
| 2-1               | SUMMARY OF UPPER INTERIOR HEAD IMPACT TESTS | 2-2             |
| 2-2               | TEST RESULTS SUMMARY TABLE                  | 2-3             |
| 2-3               | GENERAL TEST AND VEHICLE PARAMETER DATA     | 2-5             |
| 2-4               | TARGET MEASUREMENT REFERENCE SHEET          | 2-7             |
| 2-5               | APPROACH ANGLE LIMITS                       | 2-9             |
| 2-6               | POST-TEST VISUAL INSPECTION                 | 2-10            |
| 2-7               | TARGET IMPACT LOCATION ON FMH SUMMARY       | 2-11            |

## SECTION 1

### PURPOSE AND TEST PROCEDURE

This head impact compliance test is part of the FMVSS 201 Upper Interior Head Impact Protection Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-99-C-01005. The purpose of this head impact compliance test was to determine whether the subject vehicle, 2003 Hyundai Elantra 4-door Sedan, NHTSA No. C30503, meets the performance requirements of FMVSS 201, Occupant Protection in Interior Impact. The compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-201L-01 dated April 3, 1998.

## SECTION 2

### SUMMARY OF UPPER INTERIOR HEAD IMPACTS

A 2003 Hyundai Elantra 4-door Sedan, NHTSA No. C30503, was impacted at various locations throughout its upper interior by a 4.54 kg 50<sup>th</sup> percentile headform. A total of eleven (11) impacts were performed in this test series. The target area impacts were chosen by the NHTSA Contracting Officers Technical Representative (COTR). A summary of test results can be found on data sheet 2-1. The eleven (11) area chosen for testing were:

|     |     |      |     |      |
|-----|-----|------|-----|------|
| AP1 | BP1 | SR1  | RP2 | URBP |
| AP2 | BP2 | SR3B |     | URRP |
| AP3 |     | SR3B |     |      |

The selected impact areas on the test vehicle appeared to comply with the performance requirements of FMVSS 201.

Five Free Motion Headforms (FMH), were used in this test series. All five FMHs were calibrated prior to and after the test series. Calibration information are included in Appendix B. Each FMH weighed  $4.54 \pm 0.5$  kg, and had orthogonal tri-axis accelerometer pack mounted at the center of gravity (c.g.).

A total of three (3) channels of data for each target impact test was recorded on a Keyser Thredo data acquisition system. Data plots along with still photographs can be found in Section 3 of this report.

To document each target area impact test, one Kodak Ektapro high speed video camera was to record the headform contact with the selected target area.

**DATA SHEET 2-1**

**SUMMARY OF UPPER INTERIOR HEAD IMPACT TESTS**

|                             |                                   |                              |                    |
|-----------------------------|-----------------------------------|------------------------------|--------------------|
| Year/Make/Model/Body Style: | 2003 Hyundai Elantra 4-door Sedan |                              |                    |
| Vehicle Body Color:         | Black                             | VIN:                         | KMHNDN45D73U509422 |
| Vehicle NHTSA No.:          | C30503                            | Month & Year of Manufacture: | 09/02              |

| Test No. | Code | Target |        |        | Approach Angles (degrees) |          | Velocity (kph) | FMH HIC | HIC(d)* |
|----------|------|--------|--------|--------|---------------------------|----------|----------------|---------|---------|
|          |      | X (mm) | Y (mm) | Z (mm) | Horizontal                | Vertical |                |         |         |
| 1        | AP3  | 890    | 599    | 884    | 154                       | 43       | 23.76          | 577.7   | 602.3   |
| 2        | RP2  | 2388   | 557    | 929    | 76                        | 32       | 23.50          | 716.4   | 706.9   |
| 3        | SR3B | 2107   | 486    | 1043   | 90                        | 50       | 23.79          | 1005.8  | 925.3   |
| 4        | BP2  | 1594   | 555    | 884    | 90                        | 9        | 23.36          | 761.0   | 740.5   |
| 5        | URBP | 2209   | 373    | 1103   | 90                        | 42       | 23.39          | 602.4   | 620.9   |
| 6        | API  | 1154   | 518    | 1032   | 116                       | 33       | 23.60          | 904.0   | 848.4   |
| 7        | SR3B | 2101   | -481   | 1039   | 270                       | 50       | 23.76          | 896.5   | 842.8   |
| 8        | URRP | 2209   | -394   | 1103   | 296                       | 45       | 23.39          | 885.8   | 834.7   |
| 9        | BP1  | 1618   | -467   | 1109   | 270                       | 16       | 23.77          | 817.7   | 783.3   |
| 10       | AP2  | 1041   | -560   | 965    | 232                       | 48       | 23.57          | 777.9   | 753.3   |
| 11       | SR1  | 1287   | -478   | 1084   | 270                       | 21       | 23.49          | 790.0   | 762.5   |

Note : Origin of coordinate system is the front center of the vehicle bumper using Hyundai's reference coordinate's (CG-FI; x 1275mm, y=345mm, z=910mm)

\*HIC(d) 0.75446((Free Motion Headform HIC)+166.4



# DATA SHEET 2-2

## TEST RESULTS SUMMARY TABLE

Year/Make/Model/Body Style:

2003 Hyundai Elantra 4-Door Sedan

Vehicle Body Color:

Black

VIN:

KMH0N45D73U509423

Vehicle NHTSA No.:

C30563

Month & Year of Manufacture:

09/02

| Target (mm)                          |      |      |      | Horizontal<br>Impact Angle | Vertical Impact<br>Angle | Velocity (KPH) | FMH IMC | EHC(d) |
|--------------------------------------|------|------|------|----------------------------|--------------------------|----------------|---------|--------|
|                                      | X    | Y    | Z    |                            |                          |                |         |        |
| A-PILLAR DRIVER SIDE                 |      |      |      |                            |                          |                |         |        |
| AP1                                  | 1139 | -504 | 1054 | R=2                        |                          | -              |         | -      |
| Rel. AP1                             | 1153 | 526  | 1026 | -                          | -                        | -              | -       | -      |
| AP2                                  | 1041 | -560 | 965  | 232                        | 48                       | 23.57          | 777.9   | 753.3  |
| AP3                                  | 889  | -600 | 874  | -                          | -                        | -              |         | -      |
| A-PILLAR PASSENGER SIDE              |      |      |      |                            |                          |                |         |        |
| AP1                                  | 1137 | 493  | 1064 | R=2                        |                          | -              |         | -      |
| Rel. AP1                             | 1154 | 518  | 1032 | 116                        | 33                       | 23.60          | 904.0   | 848.4  |
| AP2                                  | 1048 | 552  | 976  | -                          | -                        | -              | -       |        |
| AP3                                  | 890  | 599  | 854  | 154                        | 43                       | 23.76          | 577.7   | 602.3  |
| B-PILLAR DRIVER SIDE                 |      |      |      |                            |                          |                |         |        |
| BP1                                  | 1618 | -467 | 1100 | 270                        | 16                       | 23.77          | 817.7   | 783.3  |
| BP2                                  | 1596 | -542 | 883  | -                          | -                        | -              |         | -      |
| BP3                                  | 1558 | -600 | 881  | R=1                        |                          | -              | -       | -      |
| Rel. BP3                             | 1557 | -595 | 895  | -                          | -                        | -              | -       | -      |
| BP4                                  | 1648 | -638 | 784  | -                          | -                        | -              | -       | -      |
| B-PILLAR / DOOR FRAME PASSENGER SIDE |      |      |      |                            |                          |                |         |        |
| BP                                   | 1628 | 454  | 1132 | -                          |                          |                | -       | -      |
| BP2                                  | 1594 | 555  | 854  | 90                         | 9                        | 23.36          | 761.0   | 740.9  |
| BP3                                  | 1556 | 588  | 894  | R=1                        |                          | -              | -       | -      |
| Rel. BP3                             | 1560 | 581  | 908  | -                          | -                        | -              | -       |        |
| BP4                                  | 1647 | 636  | 793  | -                          | -                        | -              | -       | -      |
| OTHER PILLARS DRIVER SIDE            |      |      |      |                            |                          |                |         |        |
| OP1                                  | -    | -    | -    | -                          | -                        | -              | -       | -      |
| OP2                                  | -    | -    | -    | -                          | -                        |                | -       | -      |
| OTHER PILLARS PASSENGER SIDE         |      |      |      |                            |                          |                |         |        |
| OP1                                  | -    | -    | -    | -                          | -                        |                |         | -      |
| OP2                                  |      |      |      | -                          | -                        | -              | -       | -      |

Note: R=1 - Relocated once (one sphere) R=2 - Relocated twice (two spheres)

| Target Point                                                                |      |      |      | Horizontal Impact angle | Vertical Impact Angle | Velocity (KPH) | XMM-HIC | HIC15 |
|-----------------------------------------------------------------------------|------|------|------|-------------------------|-----------------------|----------------|---------|-------|
|                                                                             | X    | Y    | Z    |                         |                       |                |         |       |
| FRONT HEADER DRIVER SIDE                                                    |      |      |      |                         |                       |                |         |       |
| FH1                                                                         | 1076 | -384 | 1058 | -                       | -                     | -              | -       | -     |
| FH2                                                                         | 1057 | 234  | 1064 | R-1                     |                       | -              | -       | -     |
| Rel FH2                                                                     | 1078 | -236 | 1059 | -                       | -                     | -              | -       | -     |
| FRONT HEADER PASSENGER SIDE                                                 |      |      |      |                         |                       |                |         |       |
| FH1                                                                         | 1069 | 375  | 1056 | -                       | -                     | -              | -       | -     |
| FH2                                                                         | 1051 | 227  | 1063 | R-1                     |                       | -              | -       | -     |
| Rel FH2                                                                     | 1049 | 251  | 1060 | -                       | -                     | -              | -       | -     |
| SIDE RAIL DRIVER SIDE                                                       |      |      |      |                         |                       |                |         |       |
| SR1                                                                         | 1287 | -478 | 1084 | 773                     | 21                    | 23.40          | 790.2   | 762.3 |
| SR2A                                                                        | 1436 | -472 | 1094 | -                       | -                     | -              | -       | -     |
| SR2B                                                                        | 1217 | -481 | 1084 | -                       | -                     | -              | -       | -     |
| SR3B                                                                        | 2101 | 481  | 1039 | 275                     | 50                    | 23.75          | 806.5   | 842.8 |
| SIDE RAIL PASSENGER SIDE                                                    |      |      |      |                         |                       |                |         |       |
| SR                                                                          | 1297 | 468  | 1088 | R-1                     |                       | -              | -       | -     |
| Rel SR1                                                                     | 1291 | 464  | 1054 | -                       | -                     | -              | -       | -     |
| SR2A                                                                        | 1433 | 462  | 1095 | R-1                     |                       | -              | -       | -     |
| Rel SR2A                                                                    | 1434 | 468  | 1074 | -                       | -                     | -              | -       | -     |
| SR2B                                                                        | 1324 | 467  | 1091 | R-1                     |                       | -              | -       | -     |
| Rel SR2B                                                                    | 1334 | 450  | 1098 | -                       | -                     | -              | -       | -     |
| SR3B                                                                        | 2107 | 486  | 1043 | 26                      | 50                    | 21.76          | 1005.8  | 925.3 |
| REAR HEADER DRIVER SIDE                                                     |      |      |      |                         |                       |                |         |       |
| RH1                                                                         | 2315 | -348 | 1054 | -                       | -                     | -              | -       | -     |
| REAR HEADER PASSENGER SIDE                                                  |      |      |      |                         |                       |                |         |       |
| RH1                                                                         | 2321 | 347  | 1061 | -                       | -                     | -              | -       | -     |
| UPPER ROOF DRIVER SIDE                                                      |      |      |      |                         |                       |                |         |       |
| UR                                                                          | 2209 | -394 | 1103 | 298                     | 43                    | 23.37          | 885.8   | 844.7 |
| UPPER ROOF PASSENGER SIDE                                                   |      |      |      |                         |                       |                |         |       |
| UR                                                                          | 2206 | 373  | 1105 | 26                      | 42                    | 23.33          | 802.4   | 620.9 |
| REAR PILLAR DRIVER SIDE                                                     |      |      |      |                         |                       |                |         |       |
| RP1                                                                         | 2130 | -492 | 1042 | -                       | -                     | -              | -       | -     |
| RP2                                                                         | 2455 | -588 | 828  | R-1                     |                       | -              | -       | -     |
| Rel RP2                                                                     | 2401 | -571 | 820  | -                       | -                     | -              | -       | -     |
| REAR PILLAR PASSENGER SIDE                                                  |      |      |      |                         |                       |                |         |       |
| RP1                                                                         | 2331 | 466  | 1048 | -                       | -                     | -              | -       | -     |
| RP2                                                                         | 2437 | 571  | 897  | R-1                     |                       | -              | -       | -     |
| Rel RP2                                                                     | 2388 | 557  | 928  | 76                      | 32                    | 23.50          | 716.4   | 706.9 |
| Note: R-1 - Relocated once (one sphere) R-2 - Relocated twice (two spheres) |      |      |      |                         |                       |                |         |       |

# DATA SHEET 2-3

## GENERAL TEST AND VEHICLE PARAMETER DATA

### TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan

Vehicle Body Color: Black VIN: KMHJDN45D73U509422

Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Engine Data: 4 Cylinders; - CID; 2.0 Liters; - cc

Engine Placement: x Longitudinal; or - Lateral

Transmission: 5 Speed; x Manual; - Automatic; - Overdrive

Final Drive: - Rear Wheel Drive; x Front Wheel Drive; - Four Wheel

Odometer Reading 35 km

Options: x A/C; x Power Steering; x Pwr.Brakes; x Pwr. Windows

Interior Trim Information :

Seat-belt anchorages on both B-pillars  
 Front grab handle on passenger side  
 Rear grab handles on both rear occupant position side rails

### DATA FROM TIRE PLACARD

Tire Pressure (at capacity): 210 kPa FRONT  
210 kPa REAR

Recommended Tire Size: P195/60R15

Tires on Test Vehicle: P195/60R15 ; Manufacturer: Michelin

Vehicle Capacity Data:

Number of Occupants: 2 Front; 3 Rear; - 3rd Seat; 5 Total

Type of Front Seats: x Bucket; - Bench; - Split Bench

Type of Front Seat Back: - Fixed; x Adjustable with x Lever or - Knob

Vehicle Capacity Weight (VCW) 385 kg (A)

No. of Occupants x 68 kg. - 340 kg (B)

Rated Cargo/Luggage Weight (RCLW) = 45 kg (A-B) Max. RCLW = 136 kg.

### TEST VEHICLE DELIVERED WEIGHT WITH MAXIMUM FLUIDS:

Left Front = 394 kg Left Rear = 251 kg

Right Front = 401 kg Right Rear = 240 kg

TOTAL FRONT = 795.0 kg TOTAL REAR = 491.0 kg

% of Total Weight 61.8 % % of Total Weight 38.2 %

TOTAL WEIGHT = 1286.0 kg

**CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:**

|                                     |   |               |    |
|-------------------------------------|---|---------------|----|
| Total Test Vehicle Delivered Weight | = | <u>1286.0</u> | kg |
| - Rated Cargo/Luggage Weight        |   | <u>45.0</u>   | kg |
| TEST VEHICLE TARGET WEIGHT:         | = | <u>1331.0</u> | kg |

**WEIGHT OF TEST VEHICLE (FULLY LOADED):**

|                   |   |               |    |                   |   |              |    |
|-------------------|---|---------------|----|-------------------|---|--------------|----|
| Left Front        | = | <u>387</u>    | kg | Left Rear         | = | <u>271</u>   | kg |
| Right Front       | = | <u>401</u>    | kg | Right Rear        | = | <u>265</u>   | kg |
| TOTAL FRONT       | = | <u>788.0</u>  | kg | TOTAL REAR        | = | <u>536.0</u> | kg |
| % of Total Weight | = | <u>59.5</u>   | %  | % of Total Weight | = | <u>40.5</u>  | %  |
| TOTAL TEST WEIGHT | = | <u>1324.0</u> | kg |                   |   |              |    |

Weight of vehicle secured in test vehicle's cargo area = 45 kg.

**TEST VEHICLE ATTITUDE (all dimensions in millimeters):****AS DELIVERED:**

Left Front 702 Right Front 702 Left Rear 682 Right Rear 685

**FULLY LOADED:**

Left Front 701 Right Front 700 Left Rear 670 Right Rear 672

Test Vehicle Wheelbase: 2609 millimeters

**TEST VEHICLE PITCH AND ROLL ANGLES:****AS DELIVERED:****PITCH ANGLES**

Left Door Sill 0.3 ° Right Door Sill 0.10 °

**ROLL ANGLES**

Front Bumper 0.2 ° Rear Bumper 0.4 °

**FULLY LOADED:****PITCH ANGLES**

Left Door Sill 0.1 ° Right Door Sill 0.1 °

**ROLL ANGLES**

Front Bumper 0.3 ° Rear Bumper 0.3 °

**AS TESTED:****PITCH ANGLES**

Left Door Sill 0.1 ° Right Door Sill 0.1 °

**ROLL ANGLES**

Front Bumper 0.3 ° Rear Bumper 0.3 °

**DATA SHEET 2-4**  
**TARGET MEASUREMENT REFERENCE SHEET**

Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHDN45D73U509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

| Measurements                                   | Description                                                                   | Left Side | Right Side |
|------------------------------------------------|-------------------------------------------------------------------------------|-----------|------------|
| M                                              | Seat fore / Aft travel (Front seats)                                          | 238       | 238        |
| T <sup>1°</sup> <small>DRIVER SIDE</small>     | Horizontal angle {CG-F1 (Left seat) to (Right A-pillar)}                      | 157       | -          |
| A1 <sup>1°</sup> <small>DRIVER SIDE</small>    | 360° - T <sup>1°</sup>                                                        | 203       | -          |
| W <sup>1°</sup> <small>DRIVER SIDE</small>     | Horizontal angle {CG-F2 (Left seat) to (Left A-pillar)}                       | 250       | -          |
| A2 <sup>1°</sup> <small>DRIVER SIDE</small>    | A2° = W <sup>1°</sup>                                                         | 250       | -          |
| U <sup>1°</sup> <small>DRIVER SIDE</small>     | Horizontal angle {CG-F2 (Left seat) to (Left B-pillar)}                       | 285       | -          |
| B1 <sup>1°</sup> <small>DRIVER SIDE</small>    | B1° = U <sup>1°</sup>                                                         | 285       | -          |
| V <sup>1°</sup> <small>DRIVER SIDE</small>     | Horizontal angle {CG-FR (Left seat) to (Right B-pillar)}                      | 201       | -          |
| B2 <sup>1°</sup> <small>DRIVER SIDE</small>    | B2° = V <sup>1°</sup>                                                         | 201       | -          |
| W <sup>2°</sup> <small>PASSENGER SIDE</small>  | Horizontal angle {CG-F2 (Right seat) to (Right A-pillar)}                     | -         | 157        |
| A1 <sup>2°</sup> <small>PASSENGER SIDE</small> | A1° (Right) = W° (Right)                                                      | -         | 157        |
| T <sup>2°</sup> <small>PASSENGER SIDE</small>  | Horizontal angle {CG-F1 (Right seat) to (Left A-pillar)}                      | -         | 249        |
| A2 <sup>2°</sup> <small>PASSENGER SIDE</small> | 360° - T° (Right)                                                             | -         | 111        |
| V <sup>2°</sup> <small>PASSENGER SIDE</small>  | Horizontal angle {CG-FR (Right seat) to (Right B-pillar)}                     | -         | 157        |
| B1 <sup>2°</sup> <small>PASSENGER SIDE</small> | B1° (Right) = V° (Right)                                                      | -         | 157        |
| U <sup>2°</sup> <small>PASSENGER SIDE</small>  | Horizontal angle {CG-F2 (Right seat) to (Right B-pillar)}                     | -         | 76         |
| B2 <sup>2°</sup> <small>PASSENGER SIDE</small> | B2° (Right) = U° (Right)                                                      | -         | 76         |
| J                                              | A-pillar {(Plane 3) - (Plane 5)}                                              | 362       | 363        |
| J/2                                            | J÷2                                                                           | 181       | 181.5      |
| D1                                             | Upper Roof {(Plane A) - (Plane B)}                                            | 1471      |            |
| D1/2                                           | D1÷2                                                                          | 735       |            |
| D2                                             | Upper Roof {(Plane C) - (Plane D)}                                            | 1146      |            |
| D2/2                                           | D2÷2                                                                          | 573       |            |
| .35D1                                          | .35 x D1                                                                      | 515       |            |
| .35D2                                          | .35 x D2                                                                      | 401       |            |
| N                                              | B-pillar {(BPR) - (lowest point on the daylight opening forward of B-pillar)} | 417       | 416        |
| N/2                                            | B-pillar {(BP3) - (lowest point on the daylight opening forward of B-pillar)} | 208.5     | 208        |

| Measurement | Description                                                                        | Left Side | Right Side |
|-------------|------------------------------------------------------------------------------------|-----------|------------|
| N/4         | B-pillar {(BP3) - ( lowest point on the daylight opening forward of B-pillar)}     | 104,25    | 104        |
| Q           | Other-pillar {(OPR) - ( lowest point on the daylight opening forward of O-pillar)} | -         | -          |
| Q/2         | Other-pillar {(OP2) - ( lowest point on the daylight opening forward of O-pillar)} | -         | -          |
| D           | {( Corner of roof area, point 7) - (roof area center, point M):                    | 656       | 656        |
| 3D/7        | (3 x D) : 7                                                                        | 281       | 281        |
| MM          | Widest door opening of slider door                                                 | -         | -          |
| M           | MM : 2                                                                             | -         | -          |

# DATA SHEET 2-5

## APPROACH ANGLE LIMITS

| Left Side   |                          |         |                        |         |             | Right Side               |         |                        |         |
|-------------|--------------------------|---------|------------------------|---------|-------------|--------------------------|---------|------------------------|---------|
| Target Code | Horizontal Angles (deg.) |         | Vertical Angles (deg.) |         | Target Code | Horizontal Angles (deg.) |         | Vertical Angles (deg.) |         |
|             | Minimum                  | Maximum | Minimum                | Maximum |             | Minimum                  | Maximum | Minimum                | Maximum |
| AP1         | 203                      | 250     | -5                     | 35      | AP1         | 111                      | 157     | 5                      | 54      |
| AP2         | 203                      | 250     | -5                     | 48      | AP2         | 111                      | 157     | -5                     | 27      |
| AP3         | 203                      | 250     | 5                      | 43      | AP3         | 111                      | 157     | 5                      | 23      |
| BP1         | 201                      | 285     | -10                    | 16      | BP1         | 76                       | 157     | -10                    | 25      |
| BP2         | ANY                      |         | 0                      | 12      | BP2         | ANY                      |         | 5                      | 9       |
| BP3         | 201                      | 285     | -10                    | -7      | BP3         | 76                       | 157     | -10                    | -7      |
| BP4         | 201                      | 285     | -10                    | -8      | BP4         | 76                       | 157     | -10                    | -9      |
| OP1         | 270                      |         | -                      | -       | OP1         | 90                       |         | -                      | -       |
| OP2         | 270                      |         |                        |         | OP2         | 90                       |         |                        | -       |
| RP1         | 270                      | 345     | -10                    | 11      | RP1         | 15                       | 90      | -10                    | 10      |
| RP2         | 270                      | 345     | -10                    | 52      | RP2         | 5                        | 90      | -10                    | 32      |
| PH1         | 180                      |         | 0                      | 50      | PH1         |                          | 180     | 0                      | 50      |
| PH2         | 180                      |         | 0                      | 50      | PH2         |                          | 180     | 0                      | 50      |
| RH          | 360                      |         | 5                      | 50      | RH          | 0                        | 0       | 0                      | 50      |
| SR1         | 270                      |         | 0                      | 31      | SR1         |                          | 90      | 0                      | 24      |
| SR2A        | 270                      |         | 0                      | 31      | SR2A        |                          | 90      | 0                      | 32      |
| SR2B        | 270                      |         | 5                      | 50      | SR2B        |                          | 90      | 0                      | 21      |
| SR3         | 270                      |         | 0                      | 36      | SR3         |                          | 90      | 0                      | 50      |
| SD          | 275                      |         | -                      | -       | SD          |                          | 90      | -                      | -       |
| URRP        | ANY                      |         | 0                      | 45      | URRP        | ANY                      |         | 0                      | 42      |

Note: BP2 target location - Seat belt anchorage

DATA SHEET 2-6

POST-TEST VISUAL INSPECTION

Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
Vehicle Body Color: Black VIN: KMHDN45D73LS09422  
Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

REMARKS:

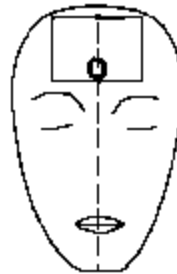
1. AP3 trim cracked upon impact, pressed trim and trim clip back into place
2. RP2 trim cracked upon impact
3. AP2 trim cracked upon impact



# DATA SHEET 2-7

## TARGET IMPACT LOCATION ON FMH SUMMARY

Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHDN45D73U509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02



~ RIGHT SIDE OF FACE

| TARGET | Distance Above Pt. O (mm) | Distance Over From Pt. O (mm) |
|--------|---------------------------|-------------------------------|
| AP3    | 22                        | 9 to the left                 |
| RP2    | 21                        | 0                             |
| SR3B   | 15                        | 15 to the left                |
| BP2    | 15                        | 15 to the right               |
| URRP   | 53                        | 4 to the right                |
| AP1    | 14                        | 24 to the right               |
| SR3B   | 19                        | 13 to the right               |
| URRP   | 46                        | 5 to the left                 |
| BP1    | 49                        | 7 to the left                 |
| AP2    | 14                        | 0                             |
| SR1    | 23                        | 4 to the left                 |

**SECTION 3**  
**SUMMARY OF TEST RESULTS AND DATA PLOTS**

# TEST SUMMARY SHEET FOR FMVSS 201/U TESTING

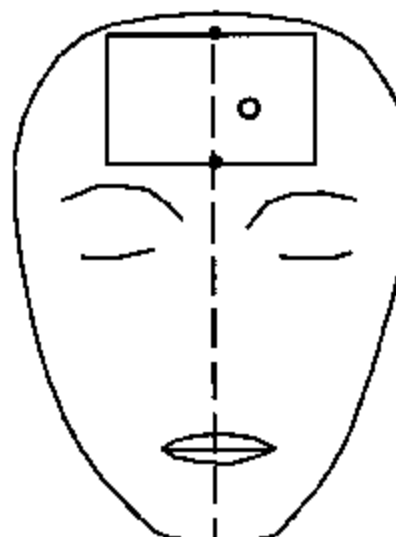
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHFN45D73U509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 1 Test Date: January 16, 2003  
 Target Location: A-pillar Target Code: AP3  
 Horizontal Impact Angle: 154 ° Vertical Impact Angle: 43 °  
 Ambient Temperature: 21 °C Time of Impact: 10:55  
 Headform Number: 1255

## Impact Point:

Description:

|               |                     |       |          |   |         |
|---------------|---------------------|-------|----------|---|---------|
| Description:  | From lower midpoint |       |          |   |         |
| On centerline | 22                  | mm up |          |   |         |
| On centerline | 9                   | -     | mm right | x | mm left |



Free Motion HIC: 577.7 HIC(d): 602.3  
 Impact Velocity (kph): 23.76 HIC1: 1.1 msec HIC2: 9.7 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - AP3

FMH Headform 1255

Location: AP3

Test Date: January 16, 2003

Work File: AP3

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 602.3

Lab Humidity: 13 %

HIC (36ms): 577.7

Velocity at Impact: 23.76 KPH

t1: 1.0 msec

t2: 9.7 msec

Free Flight Distance: 214.55 mm

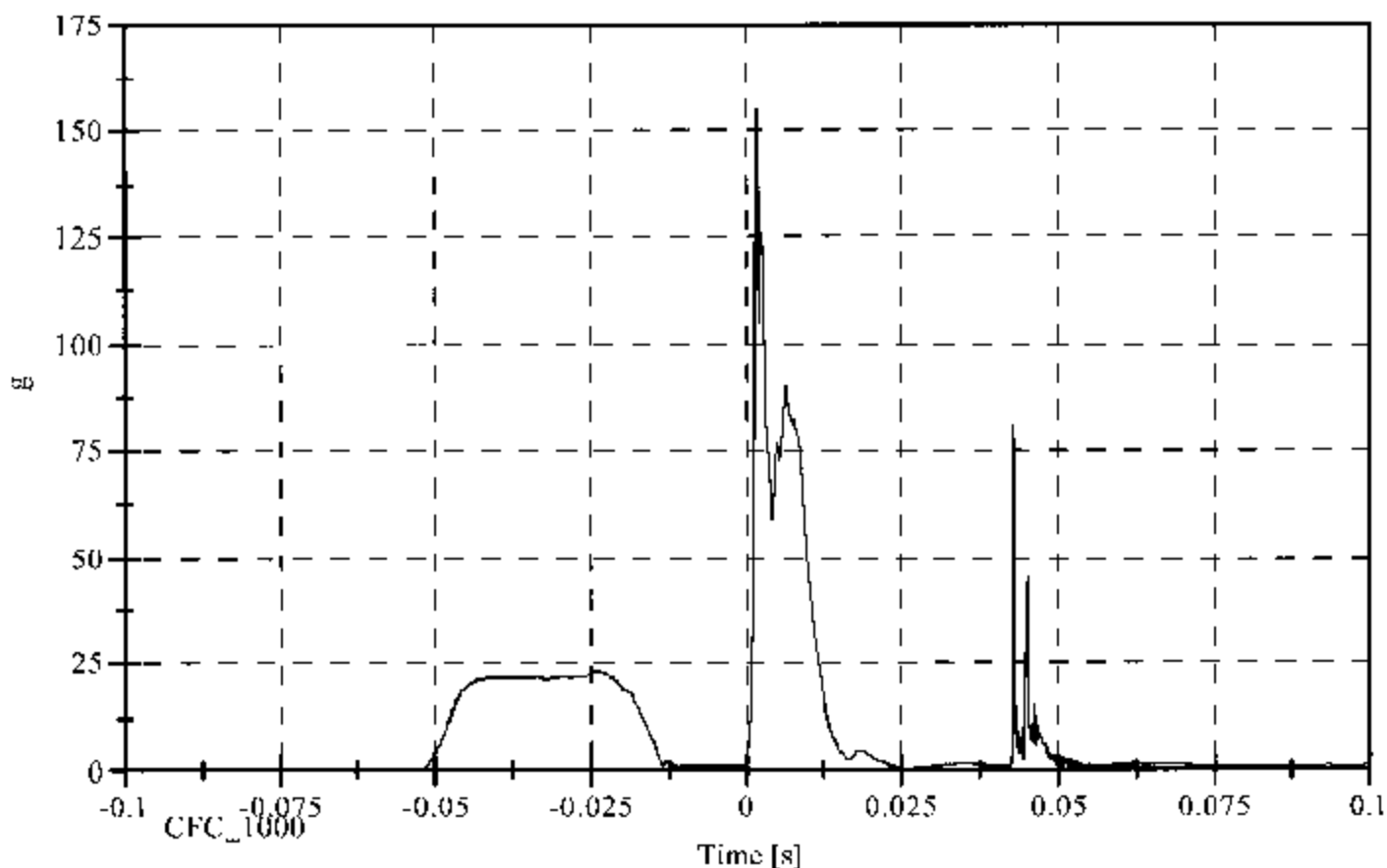
Duration: 8.7 msec

Average Acceleration: 8.8 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 155.5 [g] at 0.002 [s]

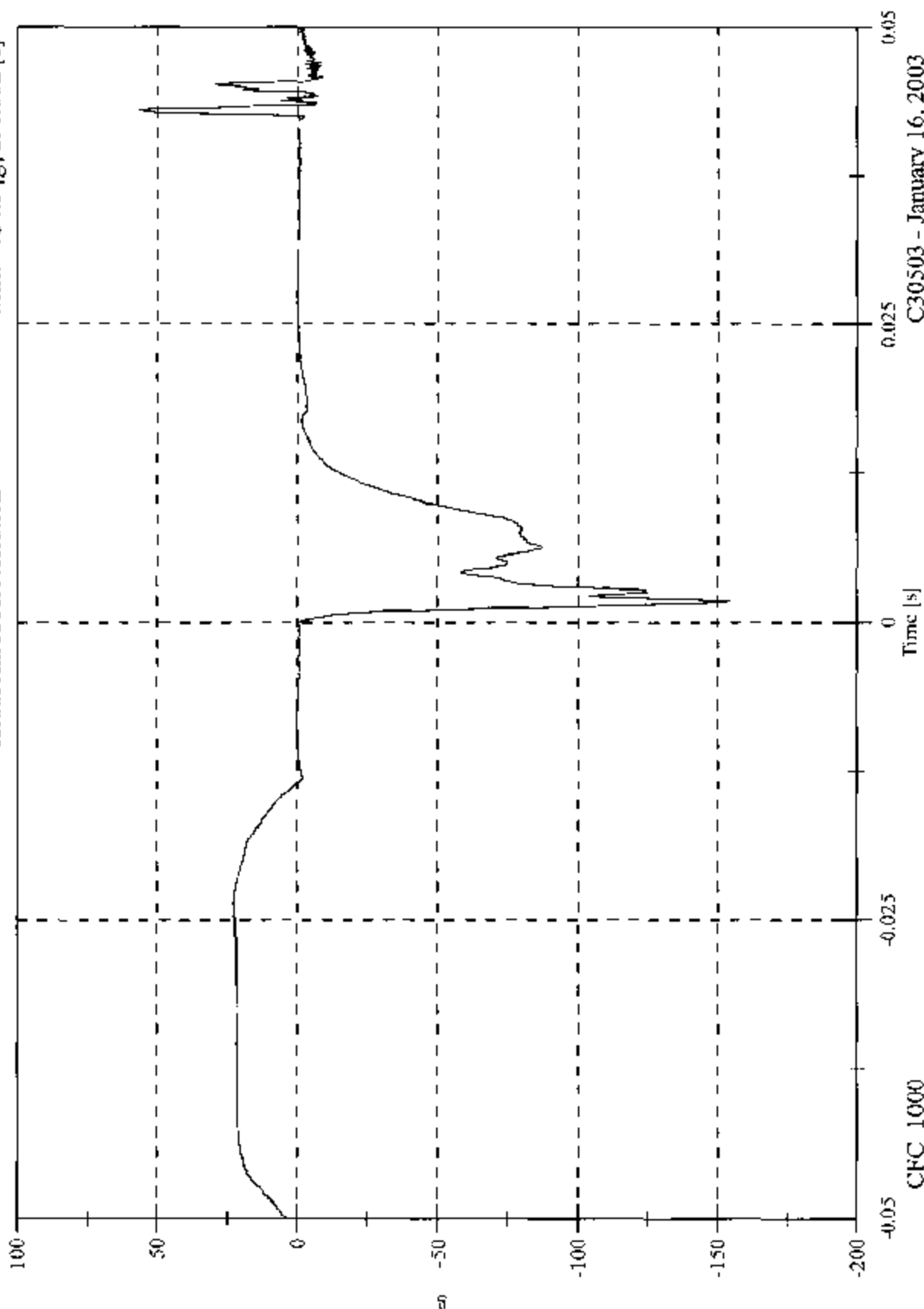
Min: 0.0 [g] at -0.087 [s]



FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 56.2 [g] at 0.043 [s]  
Min: -154.3 [g] at 0.002 [s]



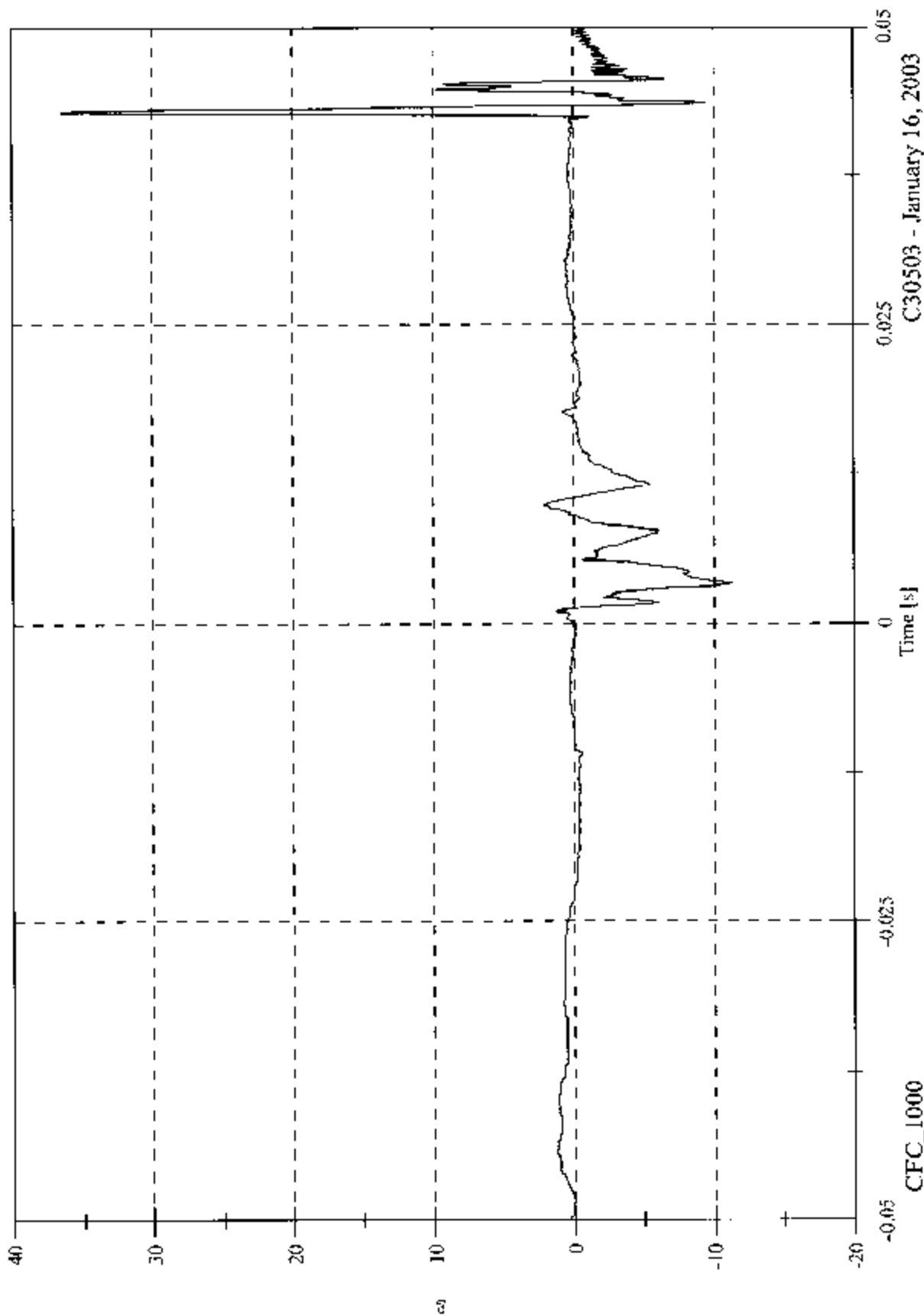
C30503 - January 16, 2003

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Y Acceleration

Max: 36.5 [g] at 0.043 [s]

Min: -11.3 [g] at 0.003 [s]



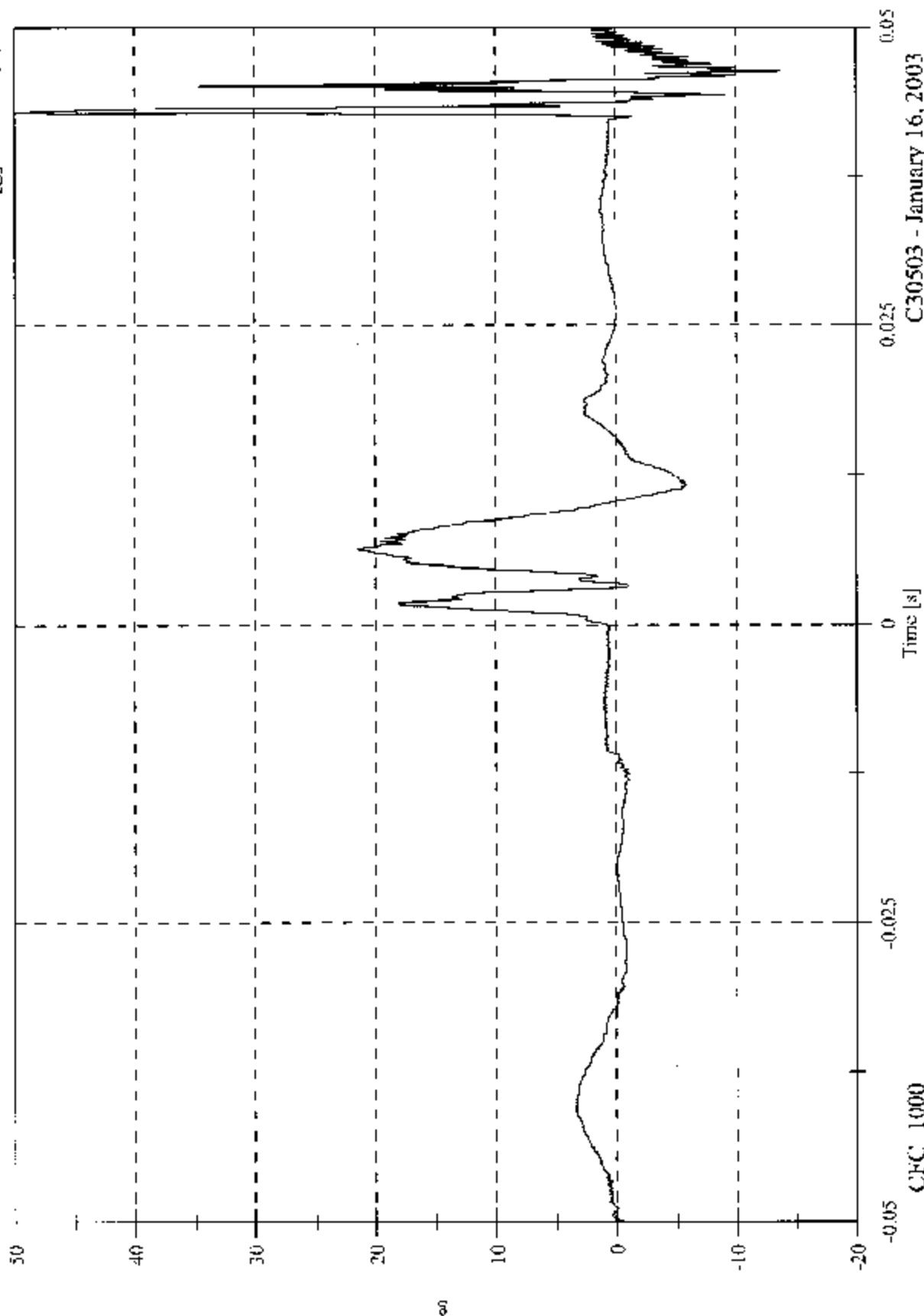
C30503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

Max: 49.7 [g] at 0.043 [s]

Min: -13.7 [g] at 0.046 [s]

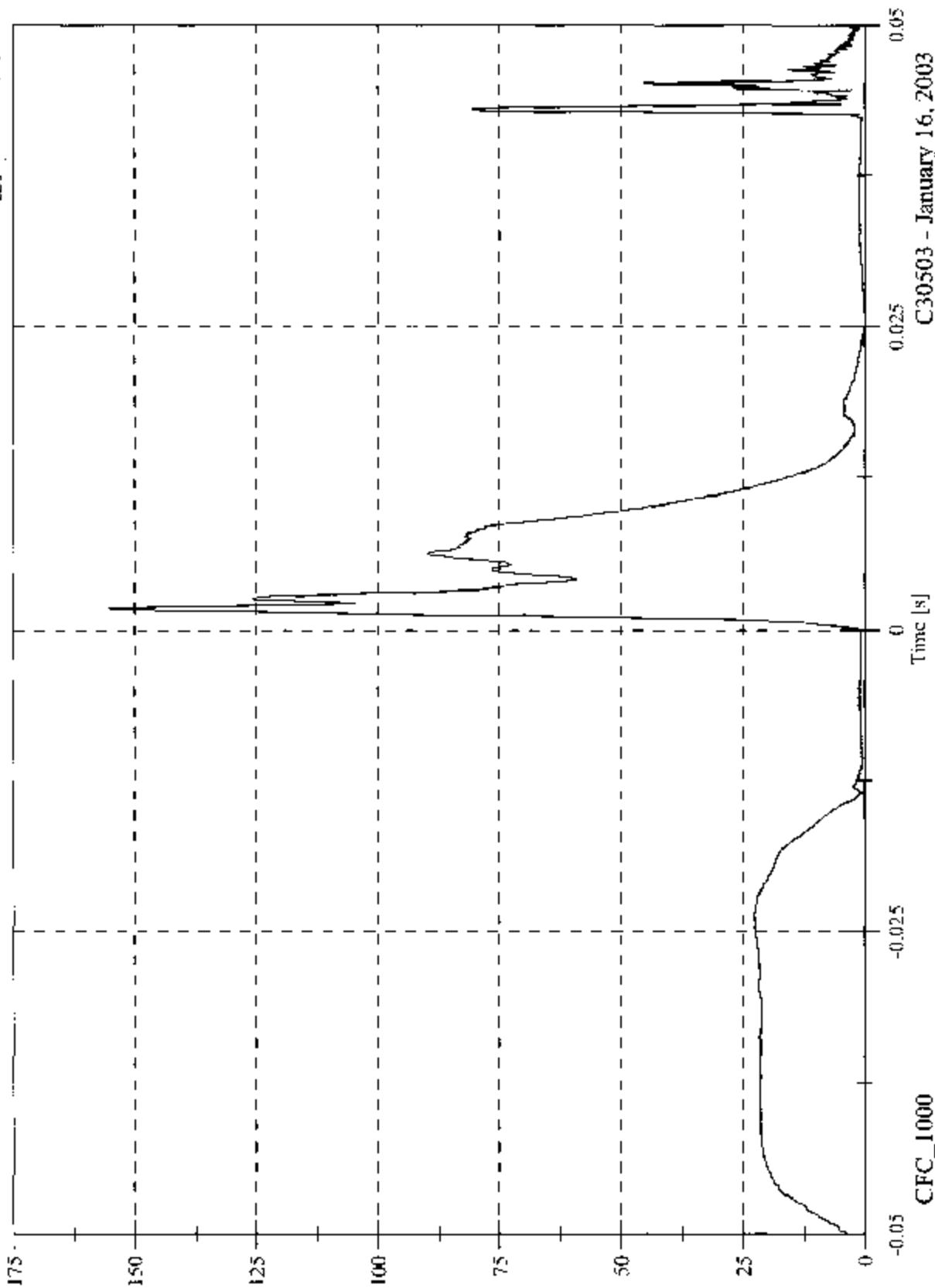


C30503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Resultant

Max: 155.5 [g] at 0.002 [s]  
Min: 0.1 [g] at 0.025 [s]

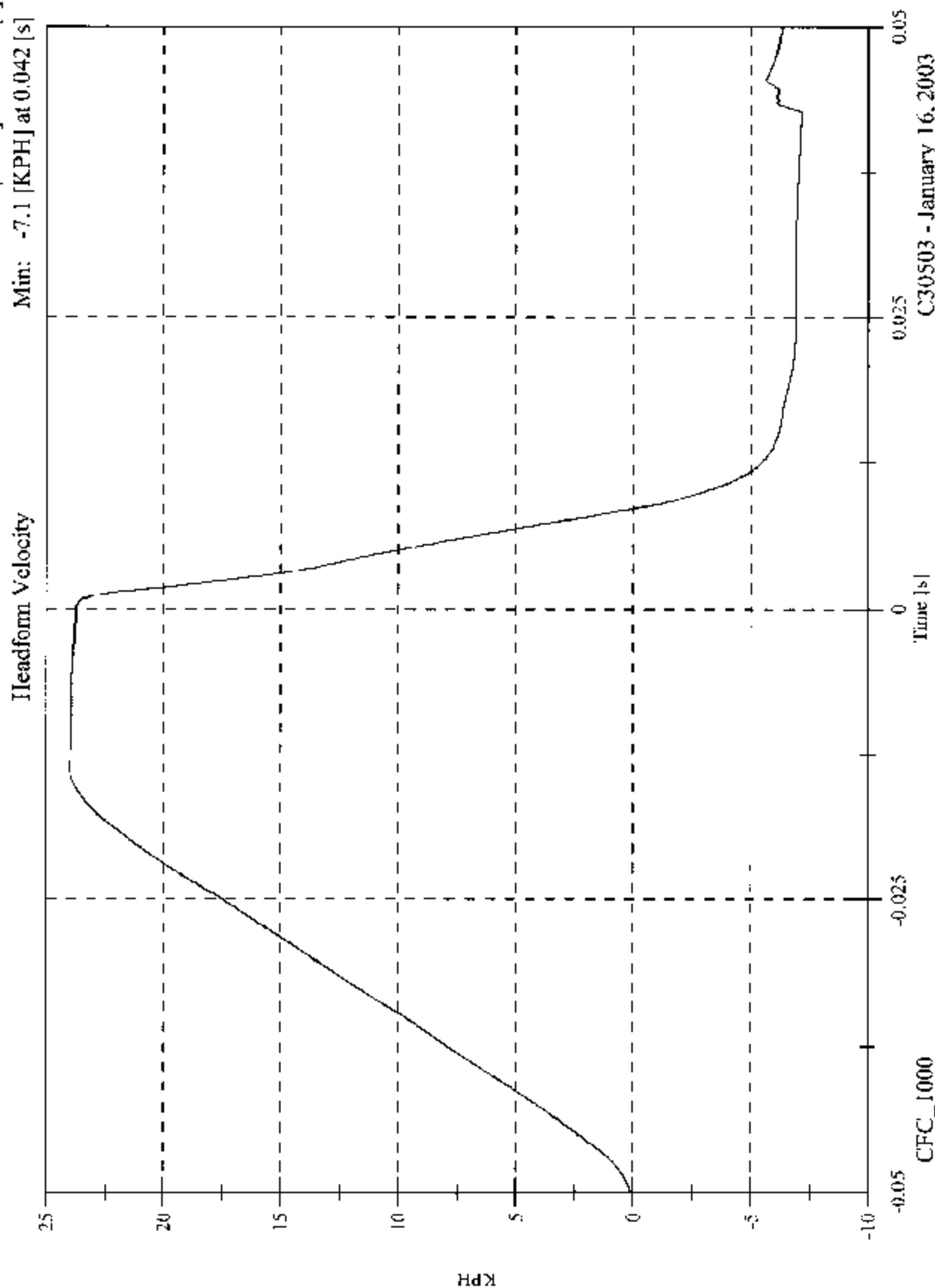


C30503 - January 16, 2003



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 24.0 [KPH] at -0.014 [s]  
 Min: -7.1 [KPH] at 0.042 [s]



CFC\_1000

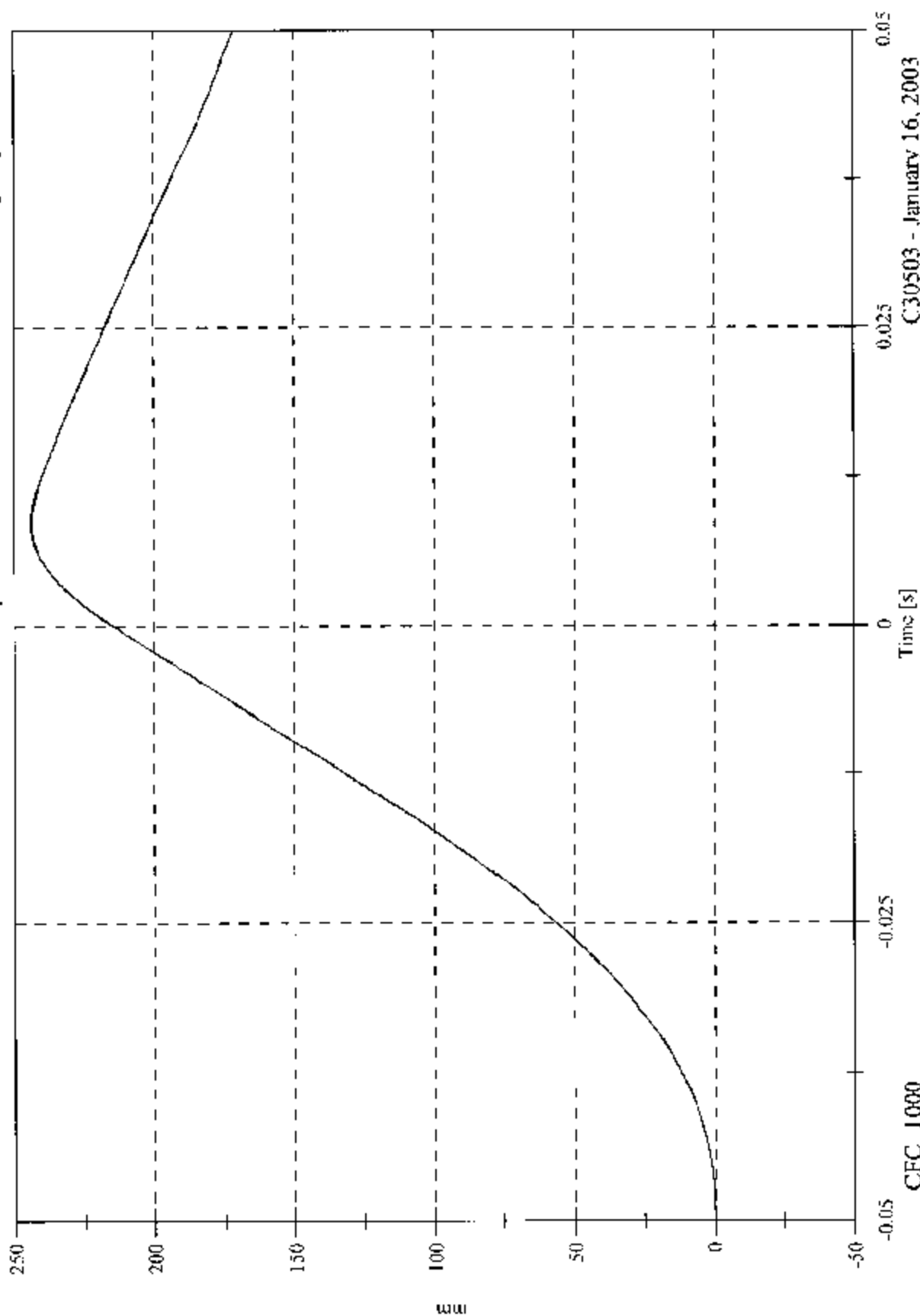
Time [s]

C30503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Displacement

Max: 244.0 [mm] at 0.009 [s]  
Min: -0.0 [mm] at -0.050 [s]



CFC\_1000

Time [s]

C30503 - January 16, 2003

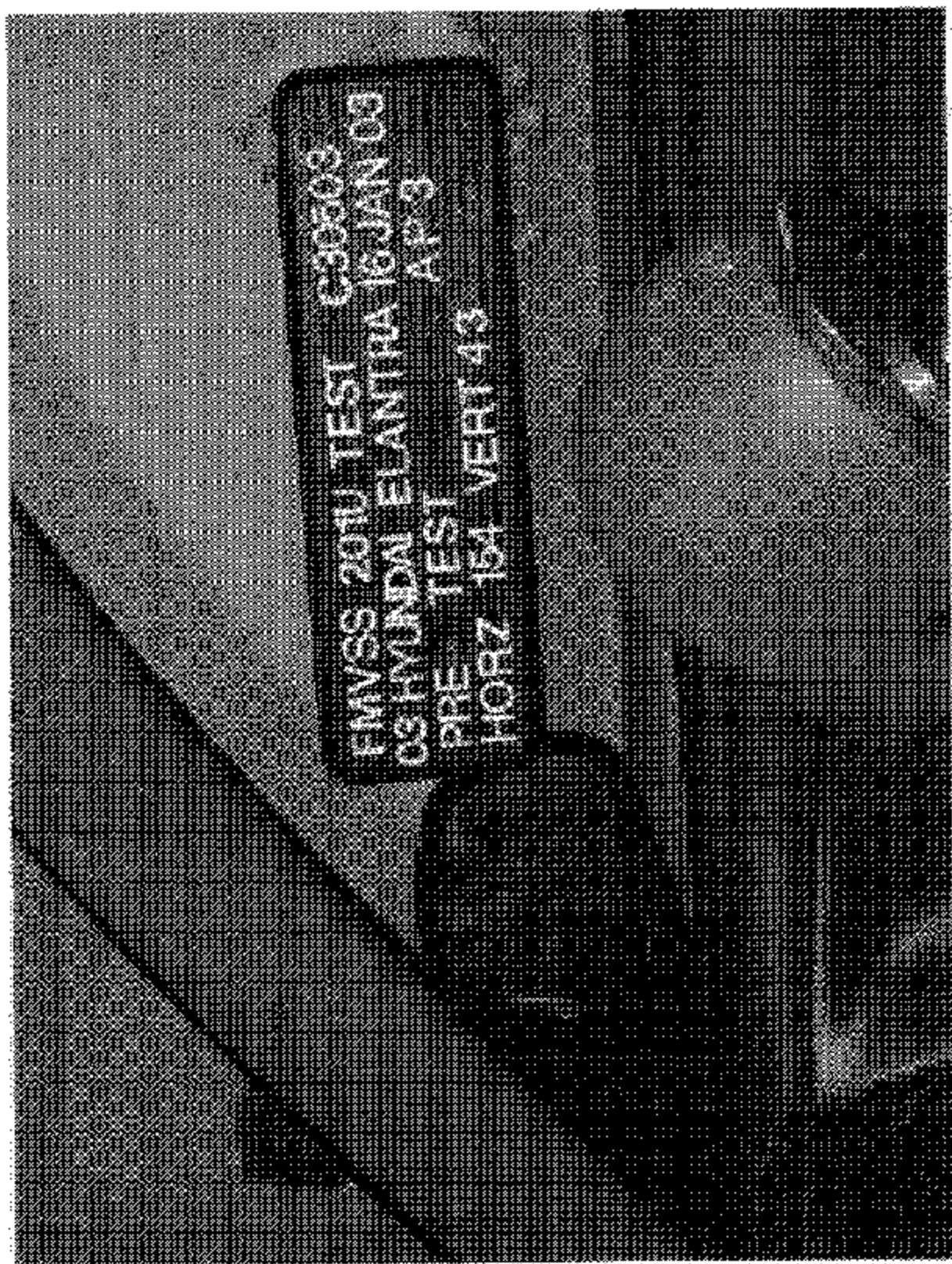


Figure : PRE-TEST AP3

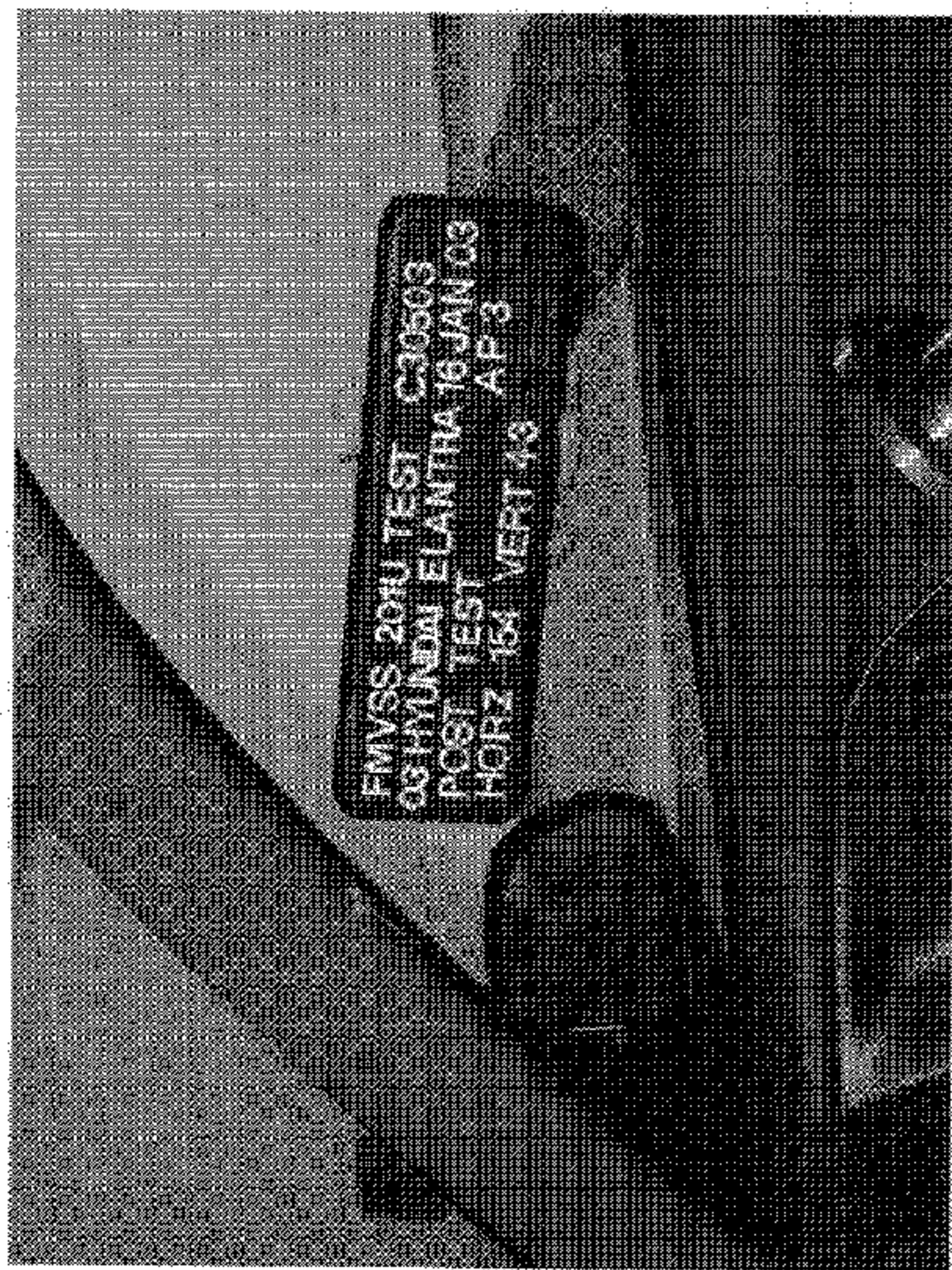


Figure : POST-TEST AP3

FMVSS 201U TEST C30503  
03 HYUNDAI ELANTRA 16 JAN 03  
POST TEST  
HORZ 154 VERT 43

Figure : AP3 HEADFORM

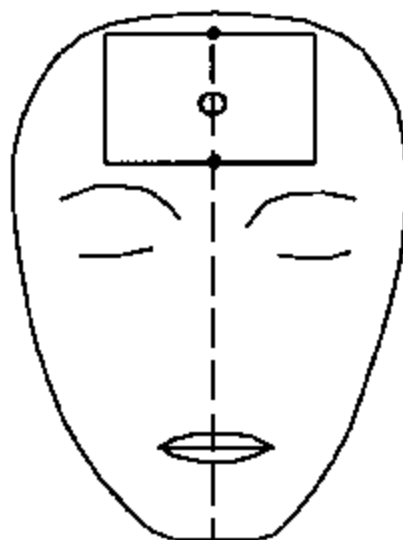
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
Vehicle Body Color: Black VIN: KMHLDN451273L 509422  
Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 2 Test Date: January 16, 2003  
Target Location: Rear Pillar Target Code: RP2  
Horizontal Impact Angle: 76° Vertical Impact Angle: 32°  
Ambient Temperature: 21 °C Time of Impact: 12:00  
Headform Number: 0062

### Impact Point:

Description:

|               |                     |       |          |           |
|---------------|---------------------|-------|----------|-----------|
| Description:  | From lower midpoint |       |          |           |
| On centerline | 21                  | mm up |          |           |
| On centerline | 0                   | -     | mm right | - mm left |



Free Motion HIC: 716.4 HIC(d): 706.9  
Impact Velocity (kph): 23.50 HIC1: 4.8 msec HIC2: 10.4 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - RP2

FMH Headform 0062

Location: RP2

Test Date: January 16, 2003

Work File: RP2

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 706.9

Lab Humidity: 13 %

HIC (36ms): 716.4

Velocity at Impact: 23.50 KPH

t1: 4.8 msec

t2: 10.4 msec

Free Flight Distance: 213.56 mm

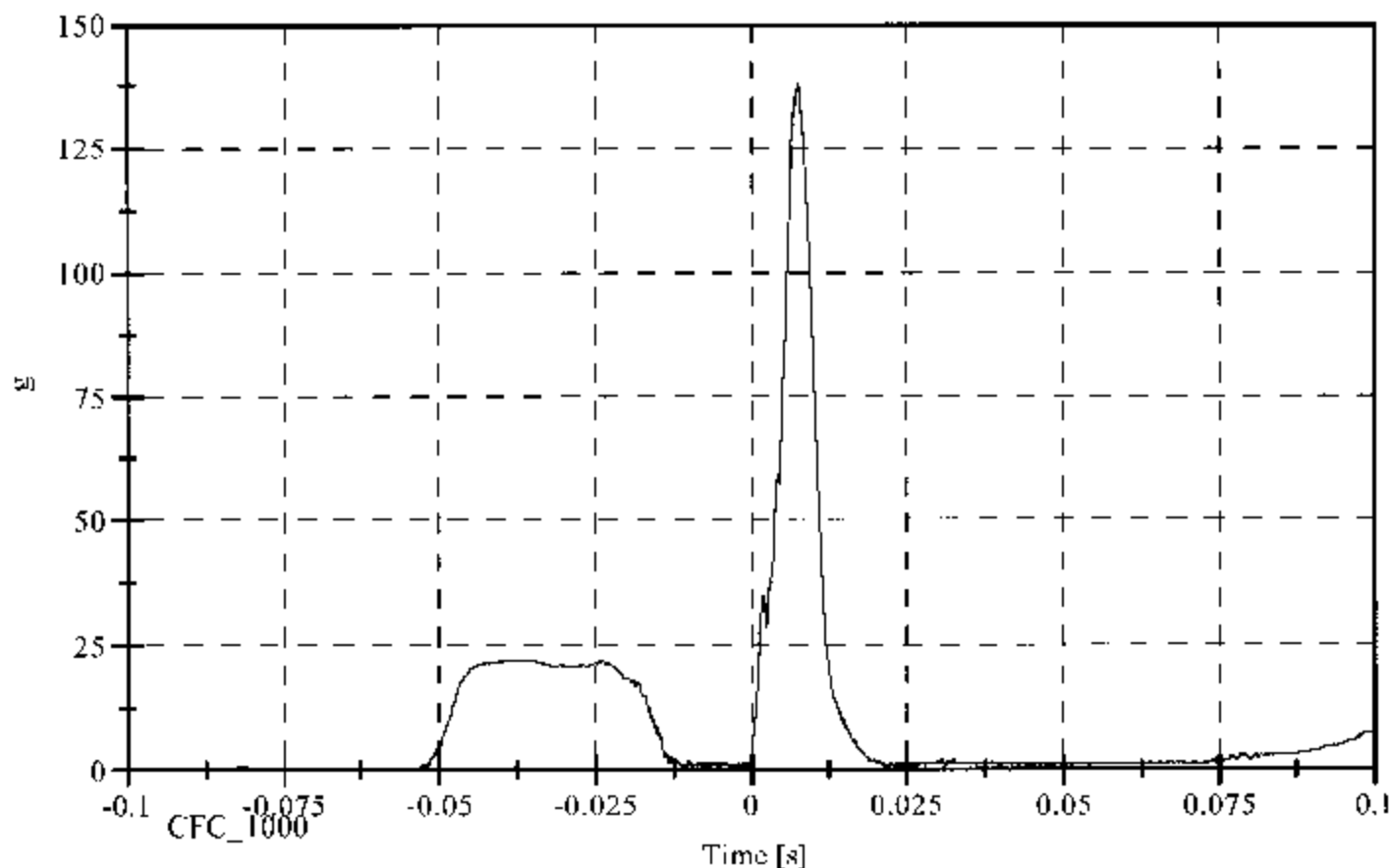
Duration: 5.6 msec

Average Acceleration: 8.9 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 137.8 [g] at 0.008 [s]

Min: 0.0 [g] at -0.058 [s]

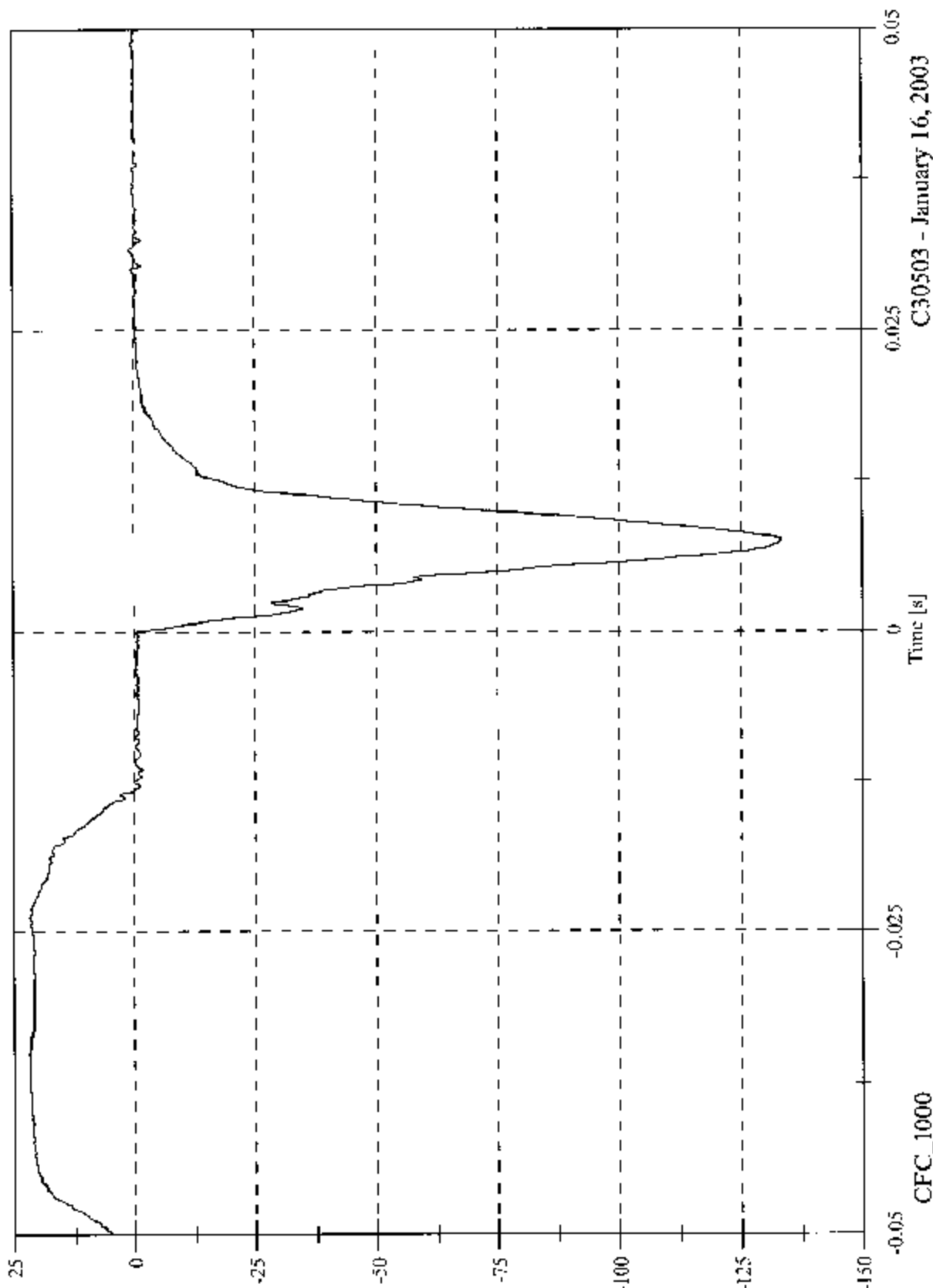


FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 21.8 [g] at -0.024 [s]

Min: -133.4 [g] at 0.008 [s]



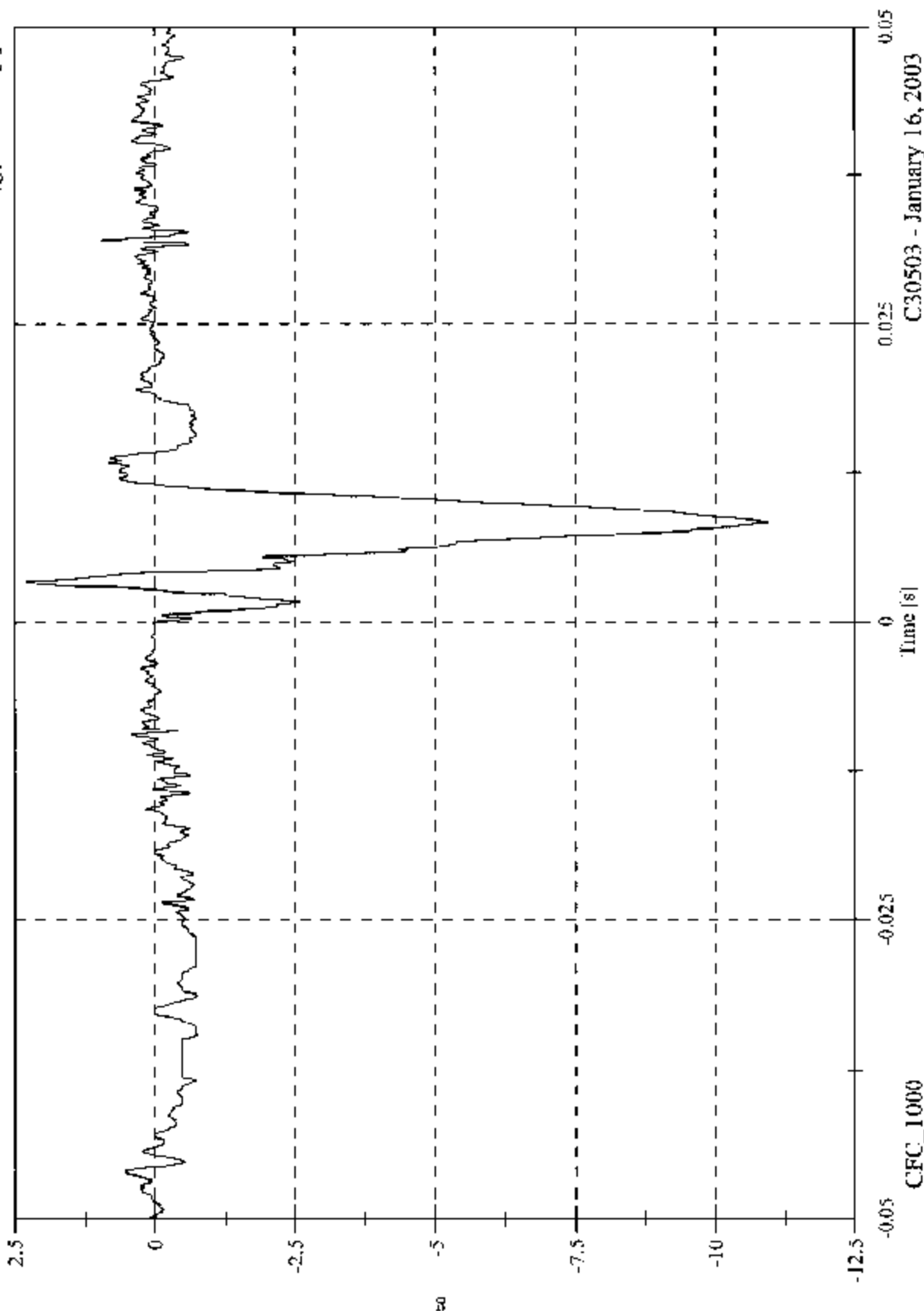
C30503 - January 16, 2003



FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Y Acceleration

Max: 2.3 [g] at 0.003 [s]  
Min: -10.9 [g] at 0.008 [s]



CFC\_1000

Time [s]

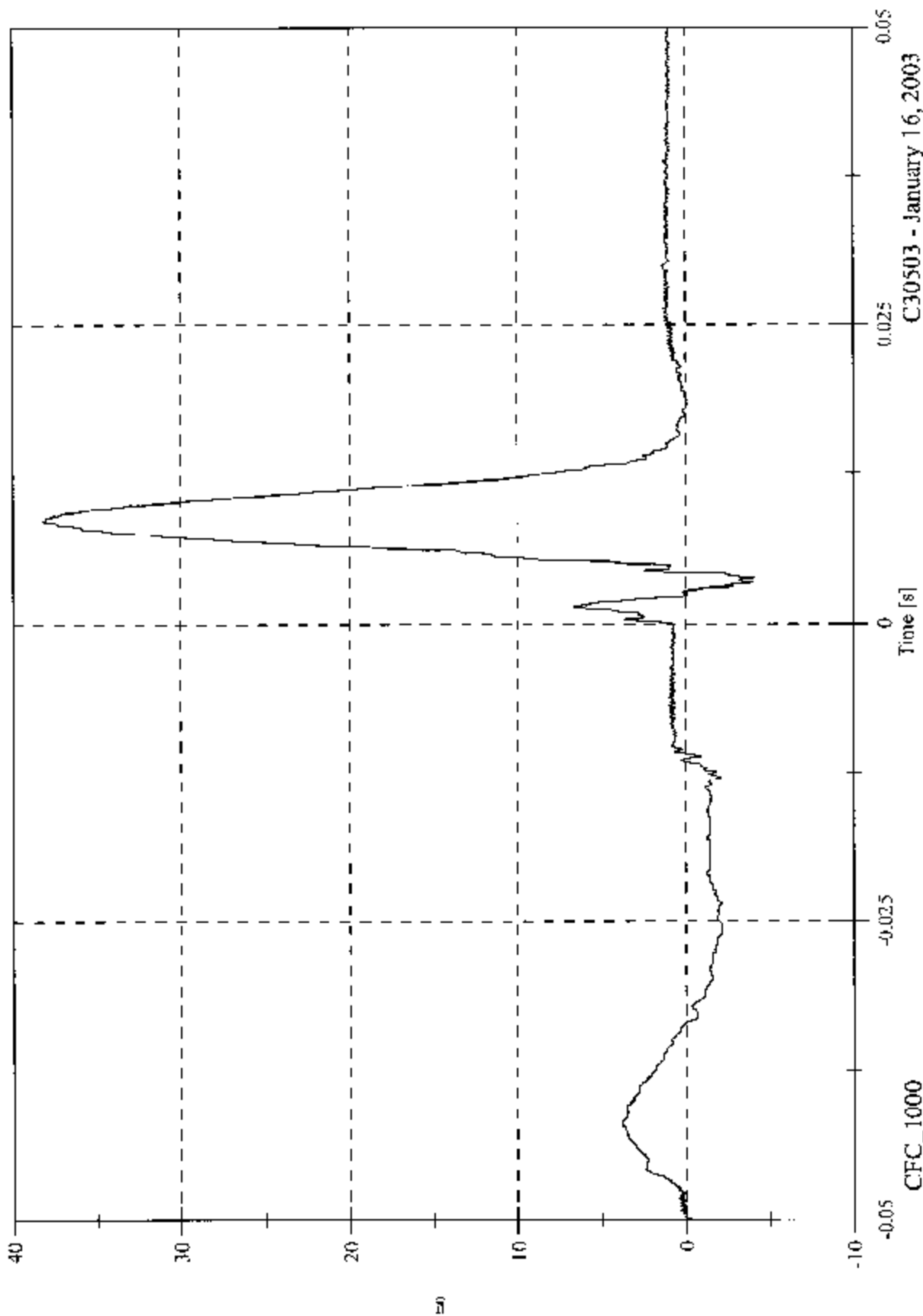
C30503 - January 16, 2003

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

Max: 38.2 [g] at 0.009 [s]

Min: -4.1 [g] at 0.004 [s]

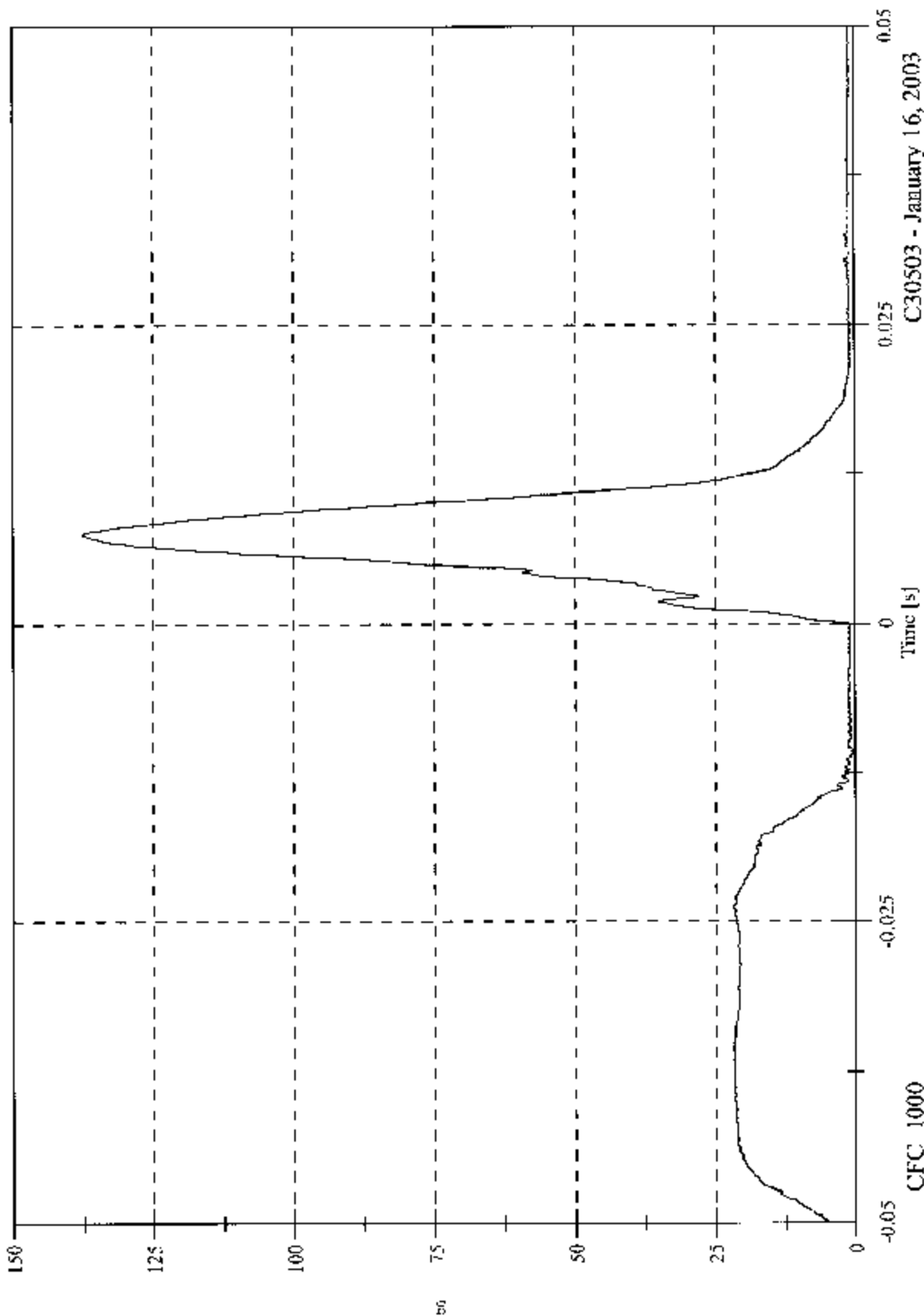


C30503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Resultant

Max: 137.8 [g] at 0.008 [s]  
Min: 0.3 [g] at -0.011 [s]



CFC\_1000

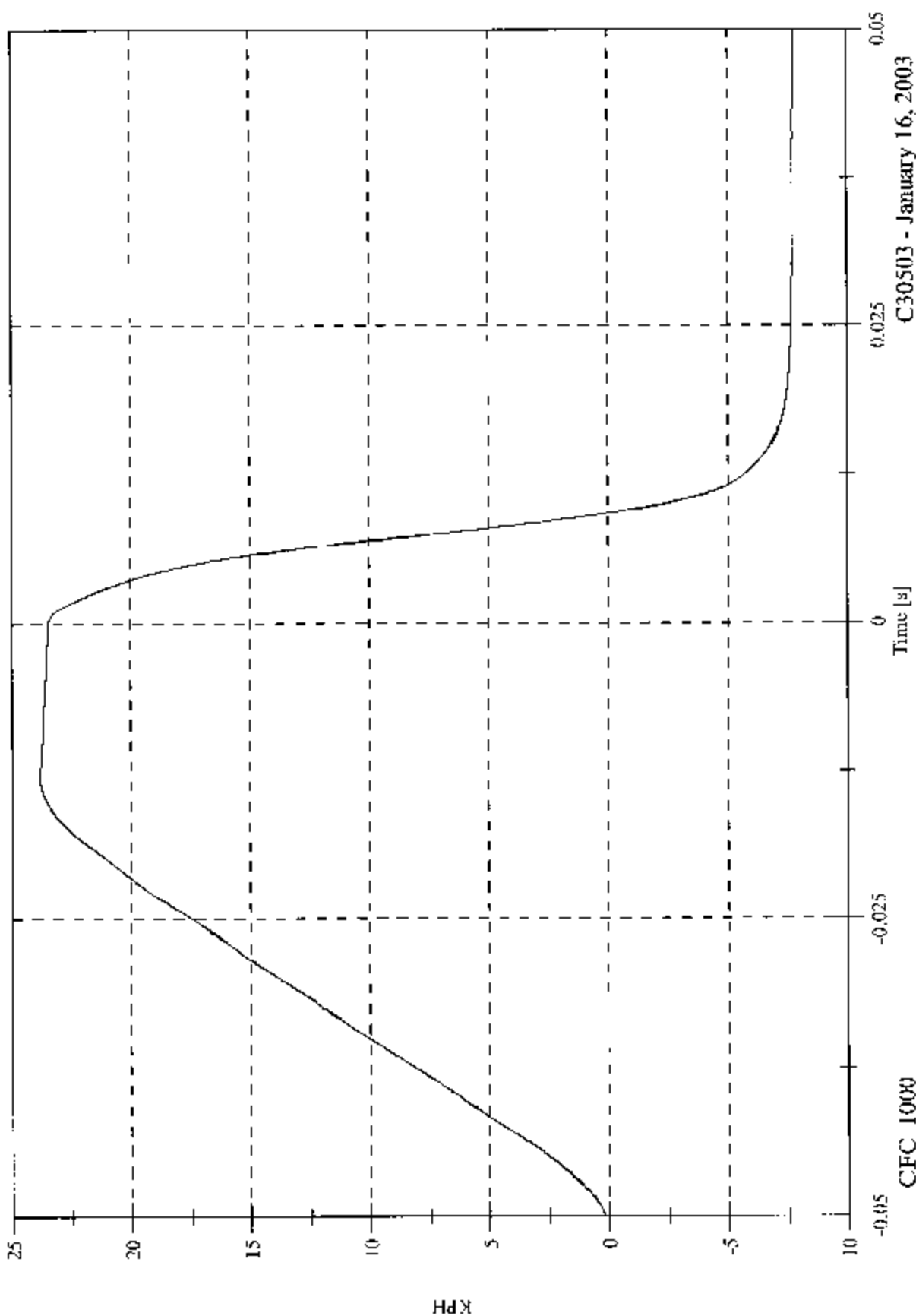
Time [s]

C30503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Velocity

Max: 23.8 [KPH] at -0.013 [s]  
Min: -7.7 [KPH] at 0.048 [s]



CFC\_1000

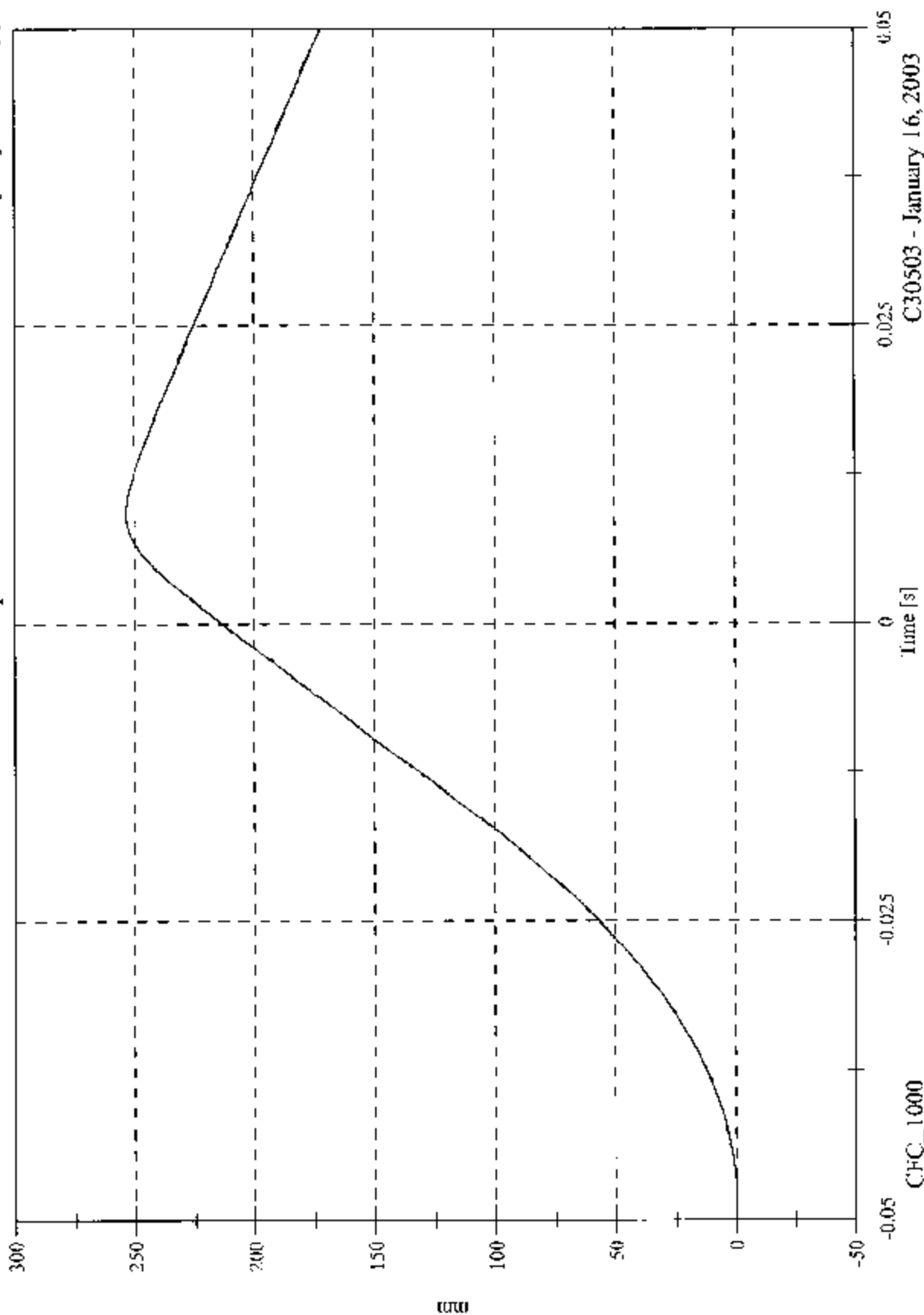
Time [s]

C30503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Displacement

Max: 253.8 [mm] at 0.009 [s]  
Min: -0.1 [mm] at -0.050 [s]



C30503 - January 16, 2003



Figure : PRE-TEST RP2



Figure : POST TEST HP2

FMVSS 2010 TEST C30503  
03 HYUNDAI ELANTRA 16JAN 03  
POST TEST RP2  
HORZ 76 VERT 32

Figure : RP2 HEADFORM



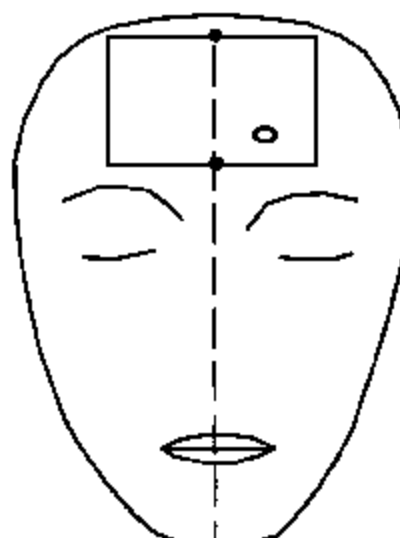
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHND45D73U509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 3 Test Date: January 16, 2003  
 Target Location: Rear Side Rail Grab Handle Target Code: SR3B  
 Horizontal Impact Angle: 90 ° Vertical Impact Angle: 50 °  
 Ambient Temperature: 21 °C Time of Impact: 1:45  
 Headform Number: 0642

# Impact Point:

Description:

|                                  |    |       |          |           |
|----------------------------------|----|-------|----------|-----------|
| Description: From lower midpoint |    |       |          |           |
| On centerline                    | 15 | mm up |          |           |
| On centerline                    | 15 | -     | mm right | x mm left |



Free Motion HIC: 1005.8 HIC(d): 925.3  
 Impact Velocity (kph): 23.79 HIC1: 1.6 msec HIC2: 8.3 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C0503 - SR3B

FMII Headform 0642

Location: SR3B

Test Date: January 16, 2003

Work File: SR3B

## -----TEST RESULTS-----

Lab Temperature: 21 C

IIICd: 925.3

Lab Humidity: 13 %

IIIC (36ms): 1005.8

Velocity at Impact: 23.79 KPH

t1: 1.6 msec

t2: 8.3 msec

Free Flight Distance: 216.86 mm

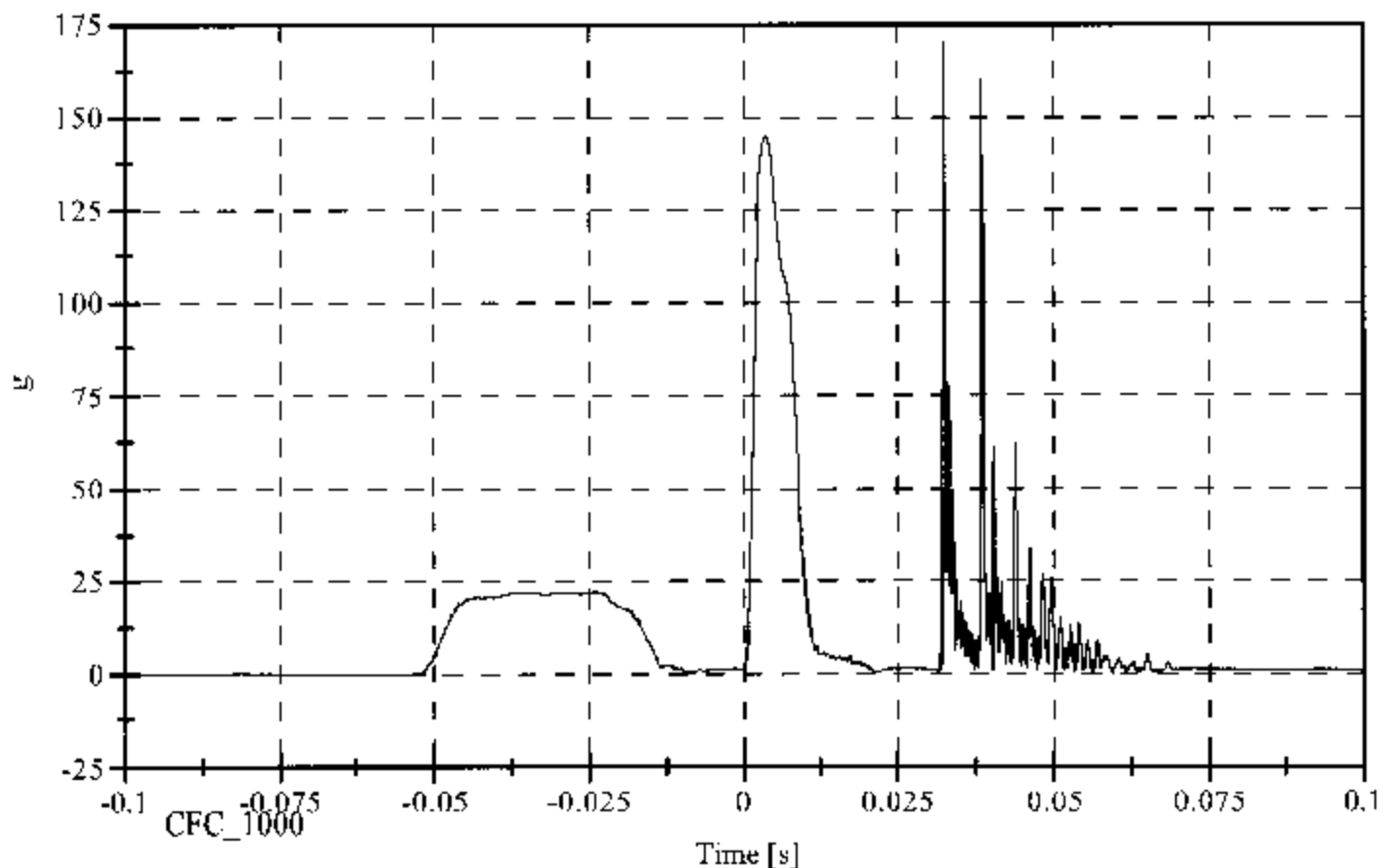
Duration: 6.7 msec

Average Acceleration: 10.9 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 170.4 [g] at 0.032 [s]

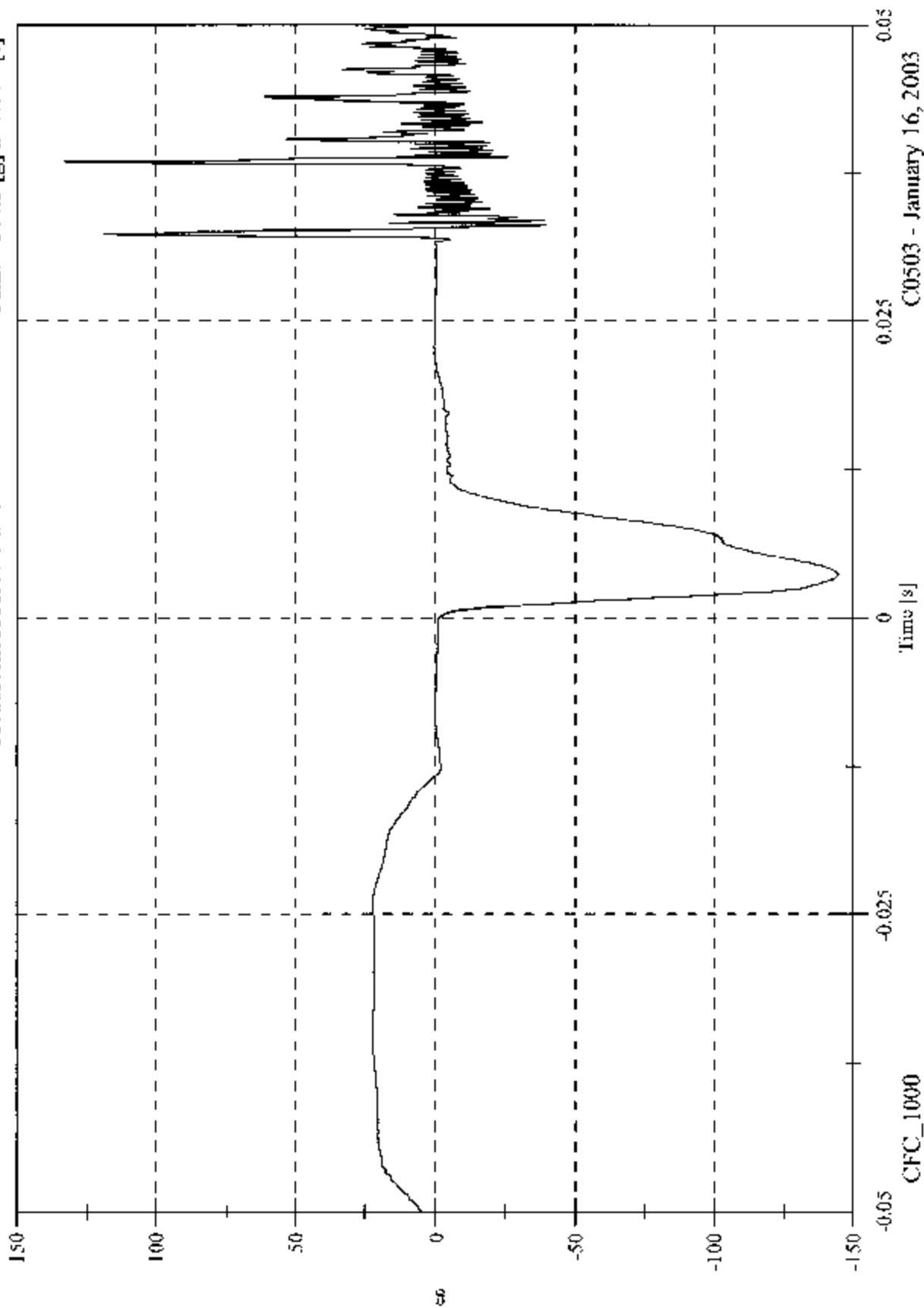
Min: -0.0 [g] at -0.099 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

J Headform X Acceleration

Max: 133.1 [g] at 0.038 [s]  
Min: -144.5 [g] at 0.004 [s]



CFC\_1000

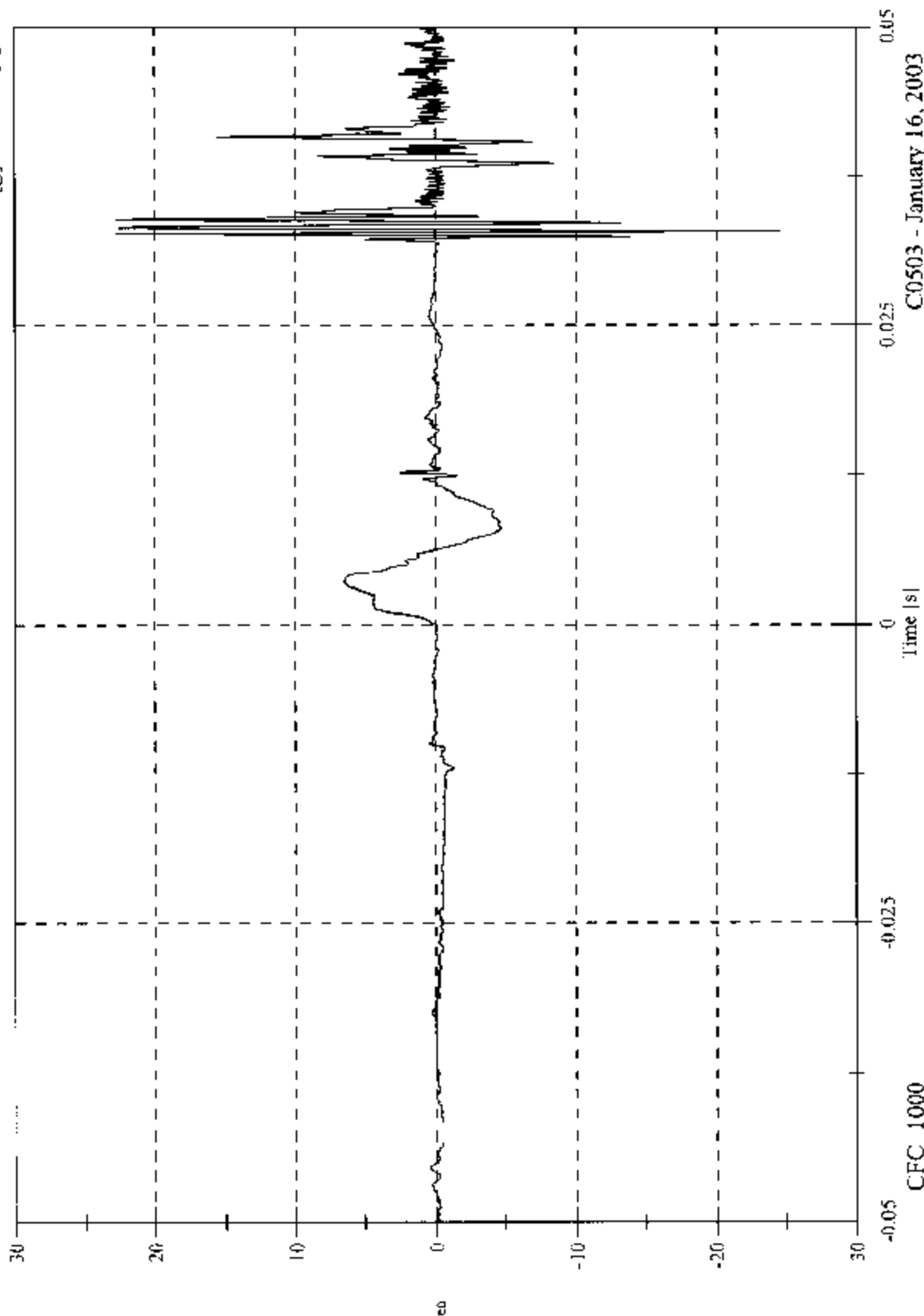
Time [s]

C0503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Y Acceleration

Max: 22.8 [g] at 0.033 [s]  
Min: -24.6 [g] at 0.033 [s]

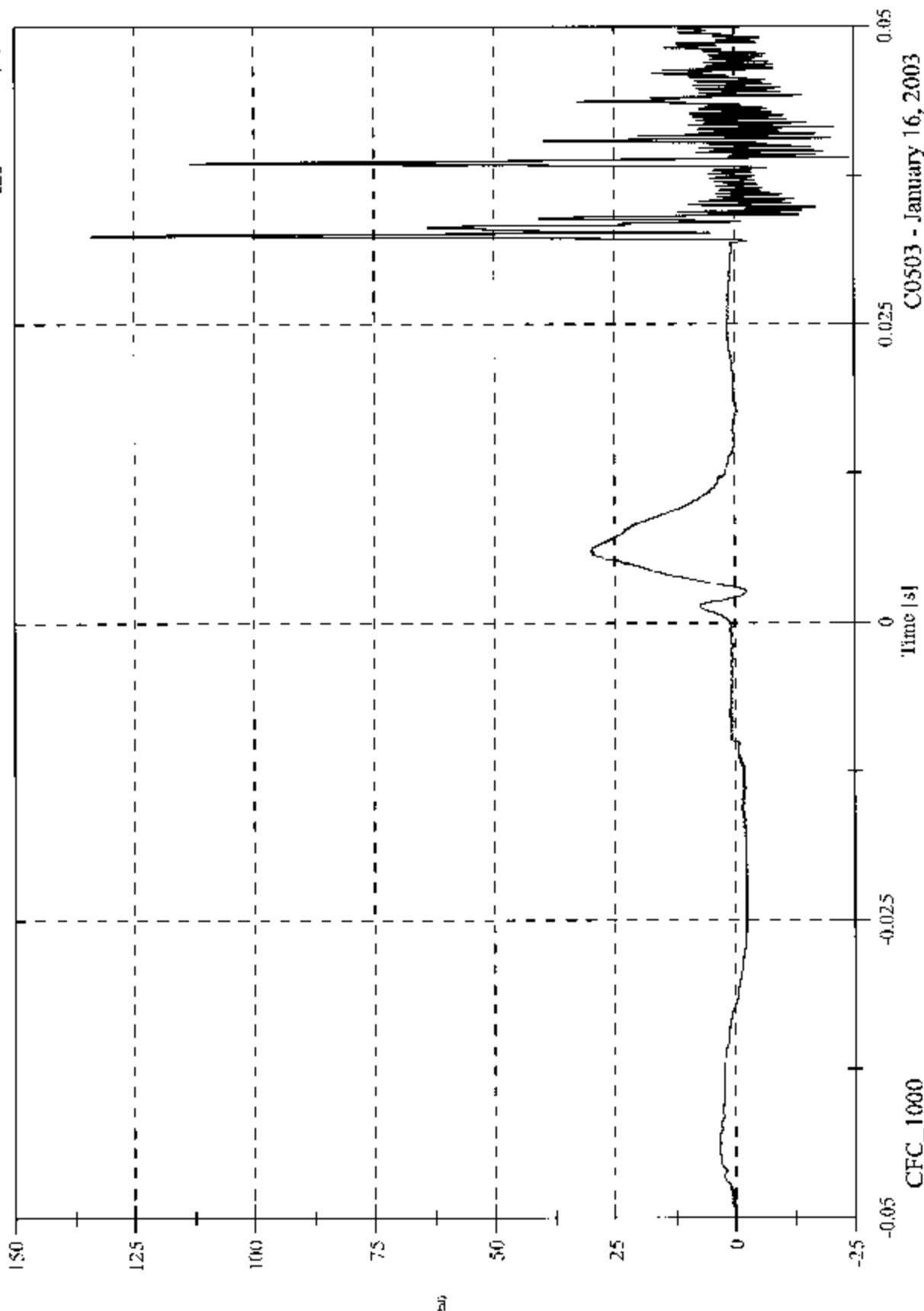


C0503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

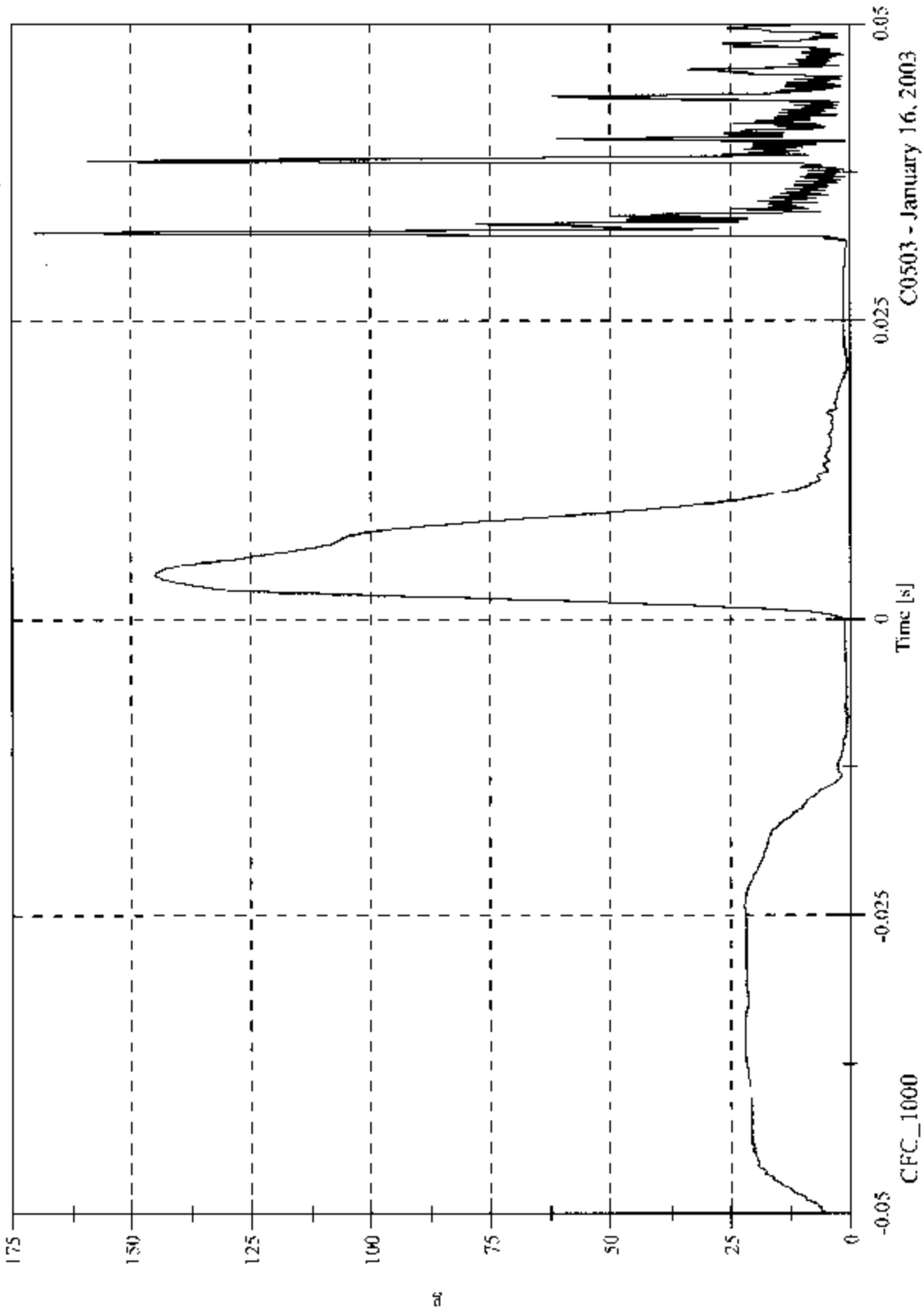
Max: 134.0 [g] at 0.032 [s]  
Min: -23.9 [g] at 0.039 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Resultant

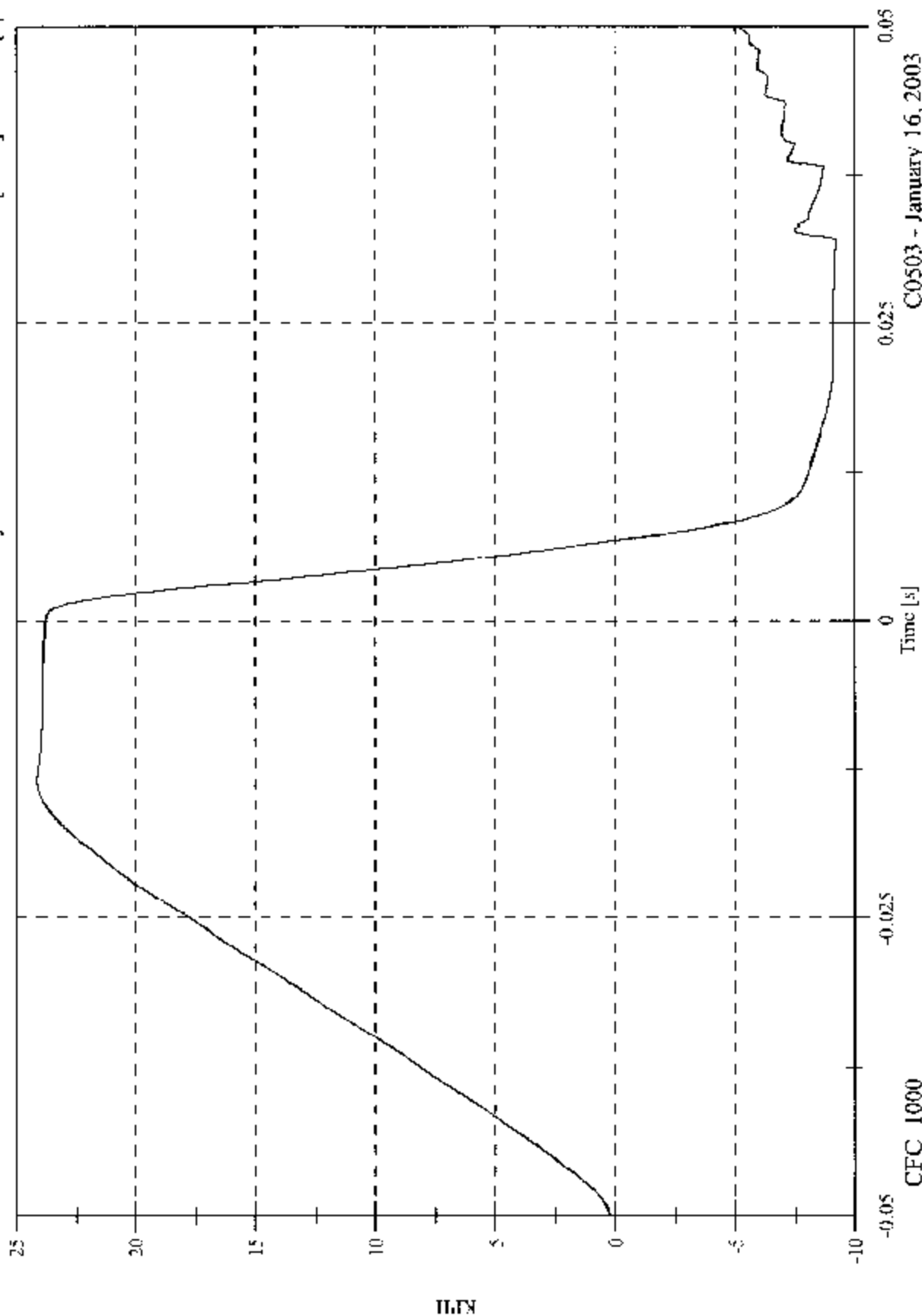
Max: 170.4 [g] at 0.032 [s]  
Min: 0.6 [g] at 0.022 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Ileadform Velocity

Max: 24.2 [KPH] at -0.013 [s]  
Min: -9.2 [KPH] at 0.032 [s]

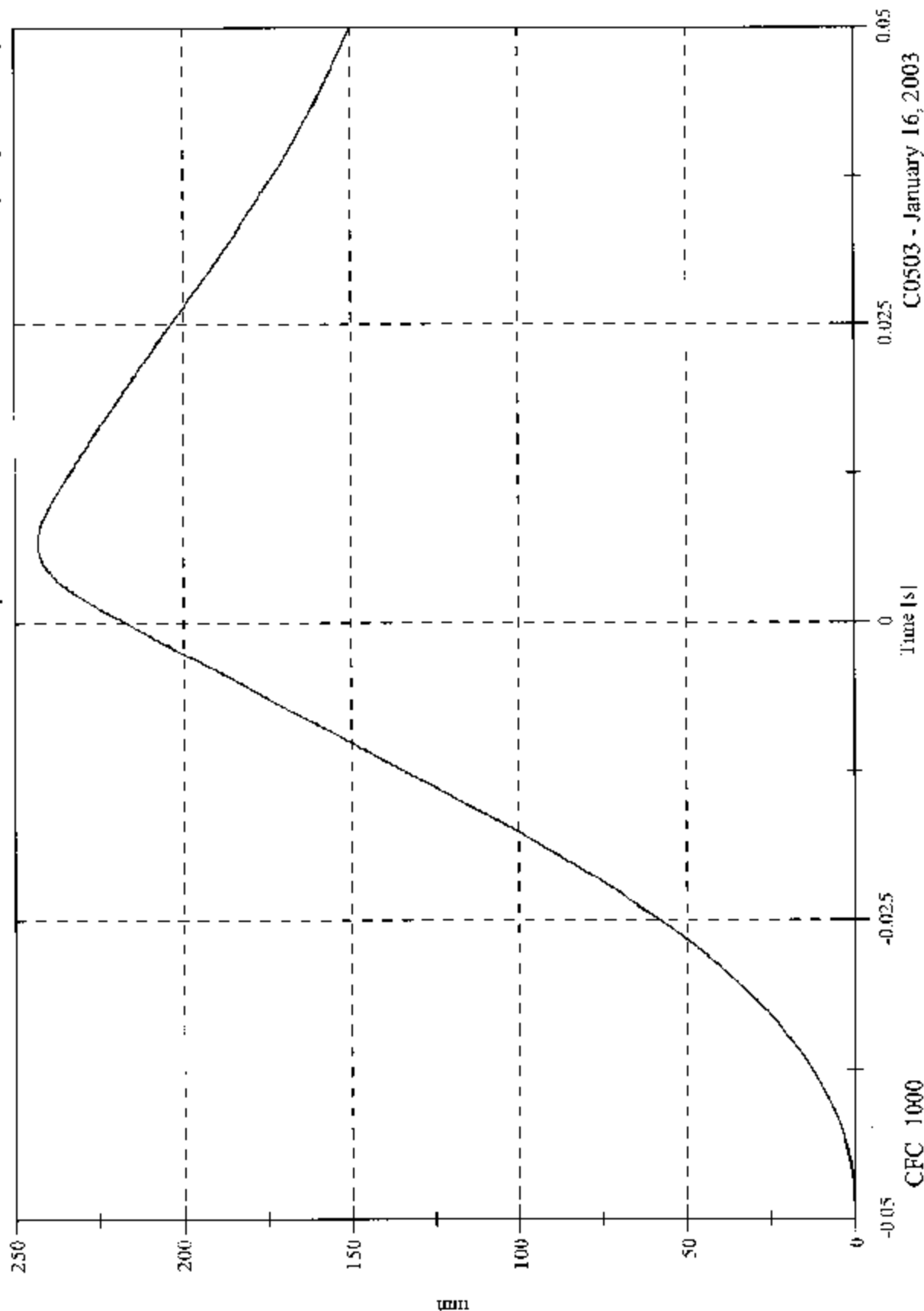


C0503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Displacement

Max: 243.3 [mm] at 0.007 [s]  
Min: 0.2 [mm] at -0.050 [s]



C0503 - January 16, 2003



FMVSS 201U TEST C30503  
03 HYUNDAI ELANTRA 16 JAN 03  
PRE TEST SR3  
HORZ 90 VERT 50

Page : 001.13-1 VR 10

FMVSS 201U TEST C30503  
03 HYUNDAI ELANTRA 16 JAN 03  
POST TEST SFR3  
HORZ 90 VERT 50

Figure POSTTEST SFR3

FMVSS 201U TEST C30503  
03 HYUNDAI ELANTRA 16 JAN 03  
POST TEST SR3  
HORZ 90 VERT 50

Figure 1 SRM HEADFORM

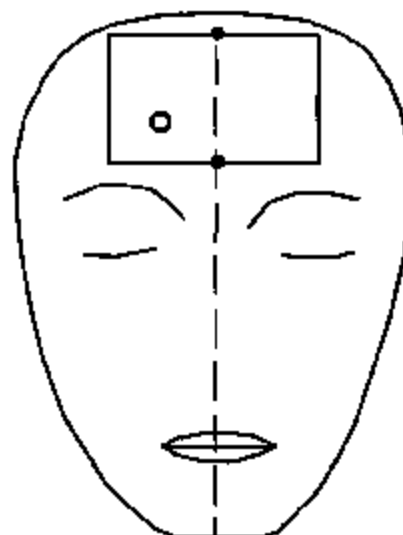
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHDN45D73U509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 4 Test Date: January 16, 2003  
 Target Location: B-pillar Seat Belt Anchorage Target Code: BP2  
 Horizontal Impact Angle: 90 Vertical Impact Angle: 9°  
 Ambient Temperature: 21 °C Time of Impact: 2:20  
 Headform Number: 805

### Impact Point:

Description:

|                                  |    |       |          |           |
|----------------------------------|----|-------|----------|-----------|
| Description: From lower midpoint |    |       |          |           |
| On centerline                    | 15 | mm up |          |           |
| On centerline                    | 15 | x     | mm right | - mm left |



Free Motion HIC: 761.0 HIC(d): 740.5  
 Impact Velocity (kph): 23.36 HIC1: 1.6 msec HIC2: 8.2 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - BP2

FMH Headform 805

Location: BP2

Test Date: January 16, 2003

Work File: BP2

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 740.5

Lab Humidity: 13 %

HIC (36ms): 761.0

Velocity at Impact: 23.36 KPH

t1: 1.7 msec

t2: 8.2 msec

Free Flight Distance: 214.09 mm

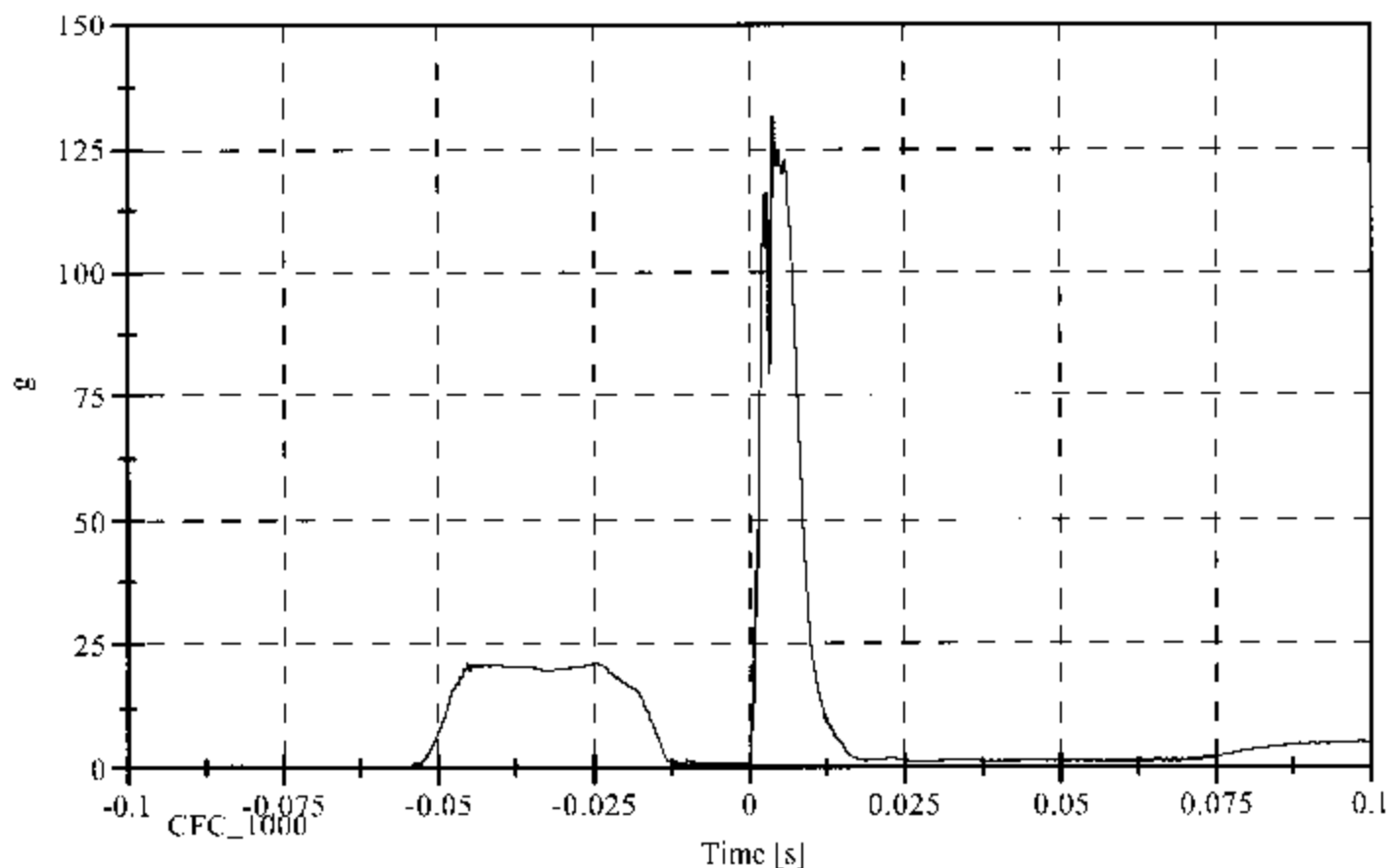
Duration: 6.5 msec

Average Acceleration: 8.7 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 131.1 [g] at 0.004 [s]

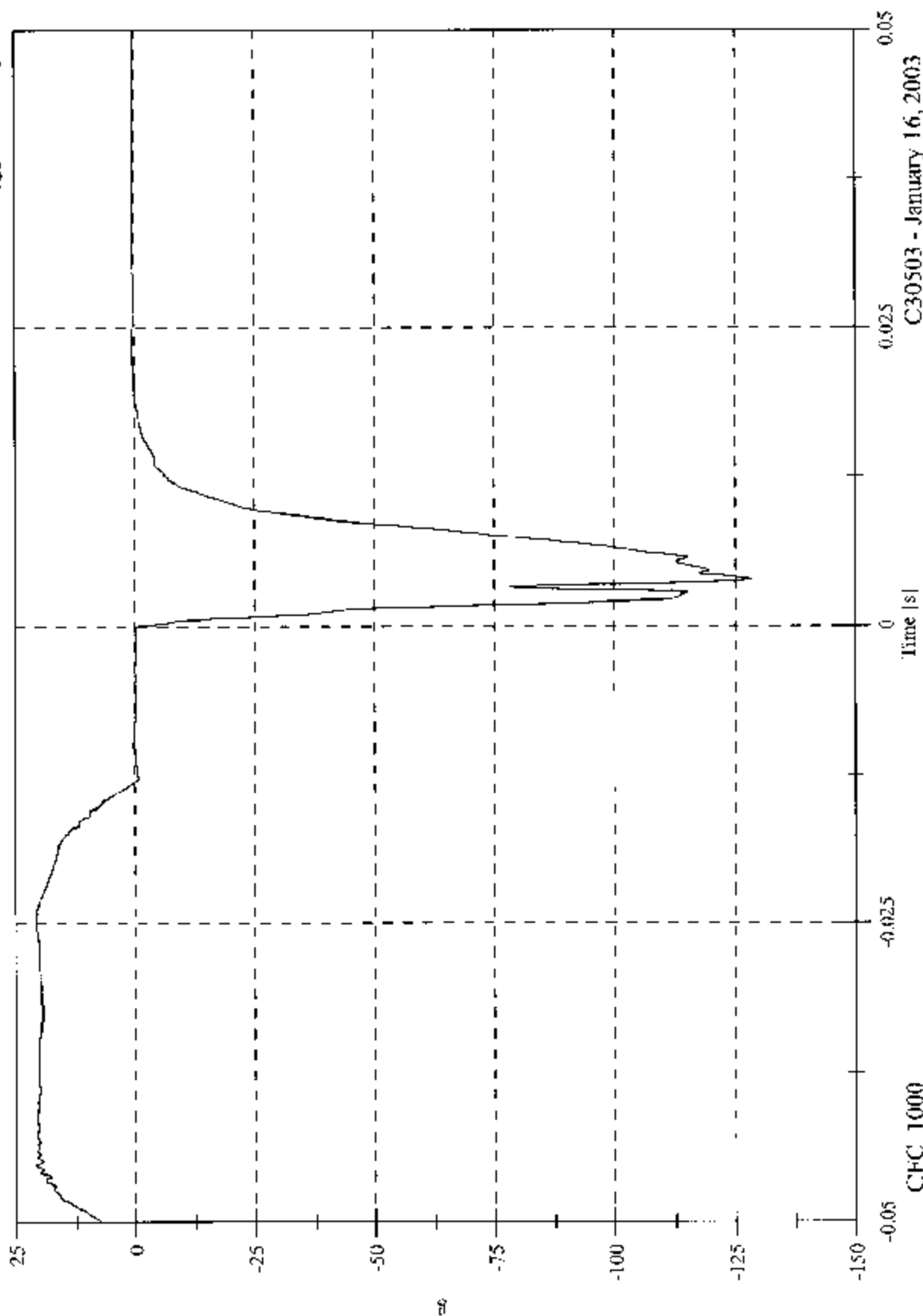
Min: 0.0 [g] at -0.097 [s]



HMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 21.0 [g] at -0.024 [s]  
Min: -128.2 [g] at 0.004 [s]



CHC\_1000

Time [s]

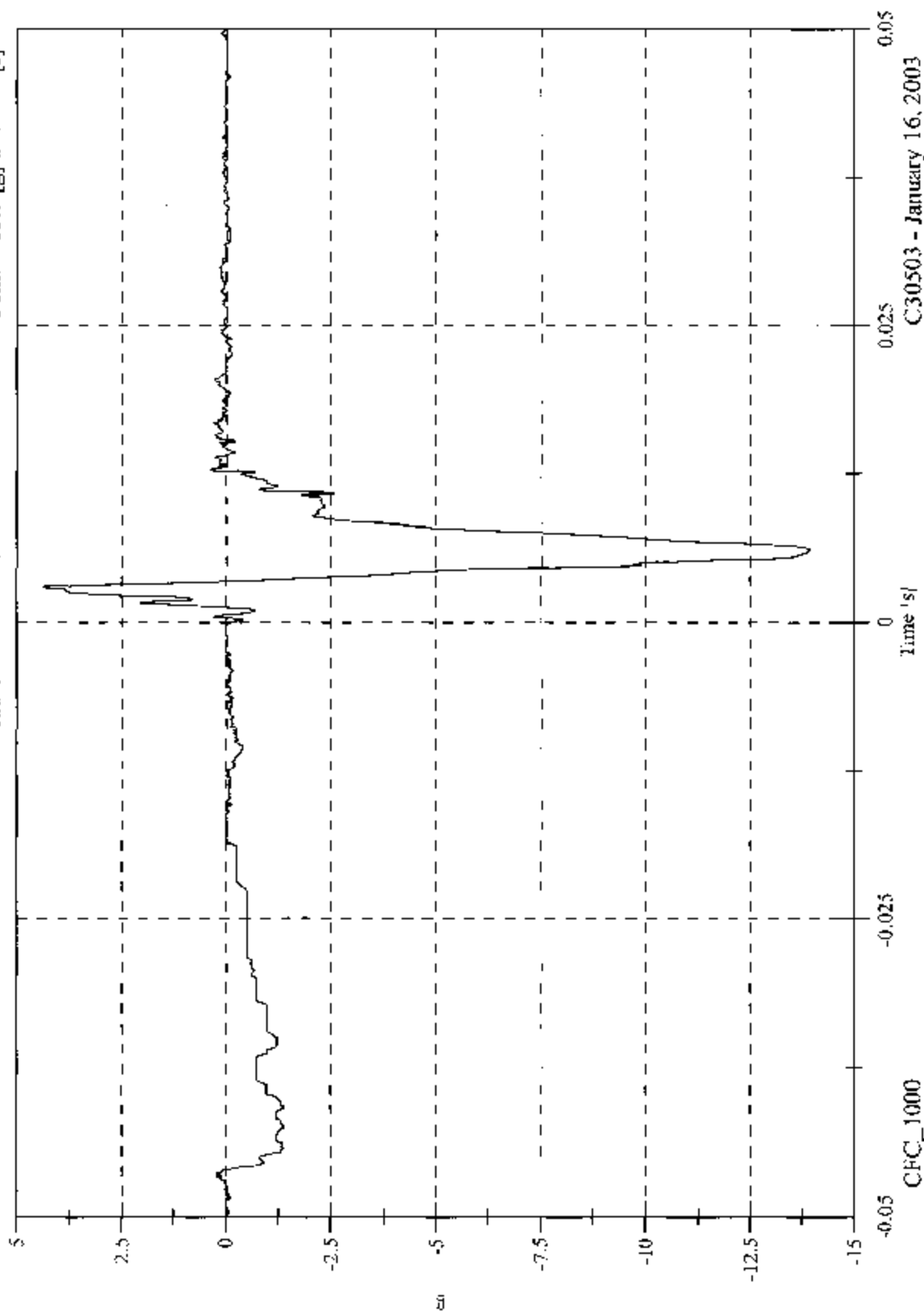
C30503 - January 16, 2003

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 4.4 [g] at 0.003 [s]

Min: -13.9 [g] at 0.006 [s]

Headform Y Acceleration



CRC\_1000

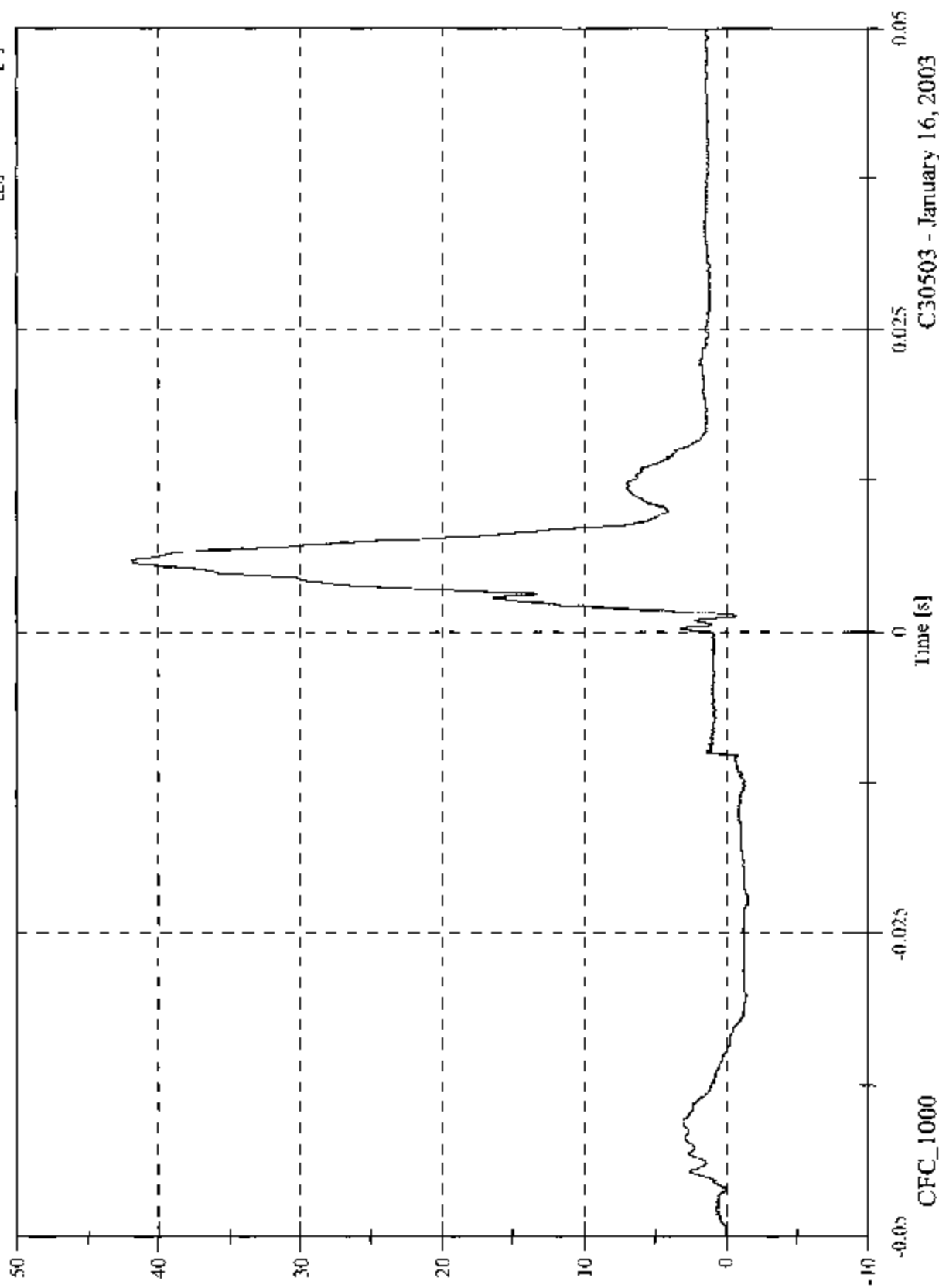
Time [s]

C30503 - January 16, 2003

# FMVSS 201C IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

Max: 41.9 [g] at 0.006 [s]  
Min: -1.5 [g] at -0.022 [s]



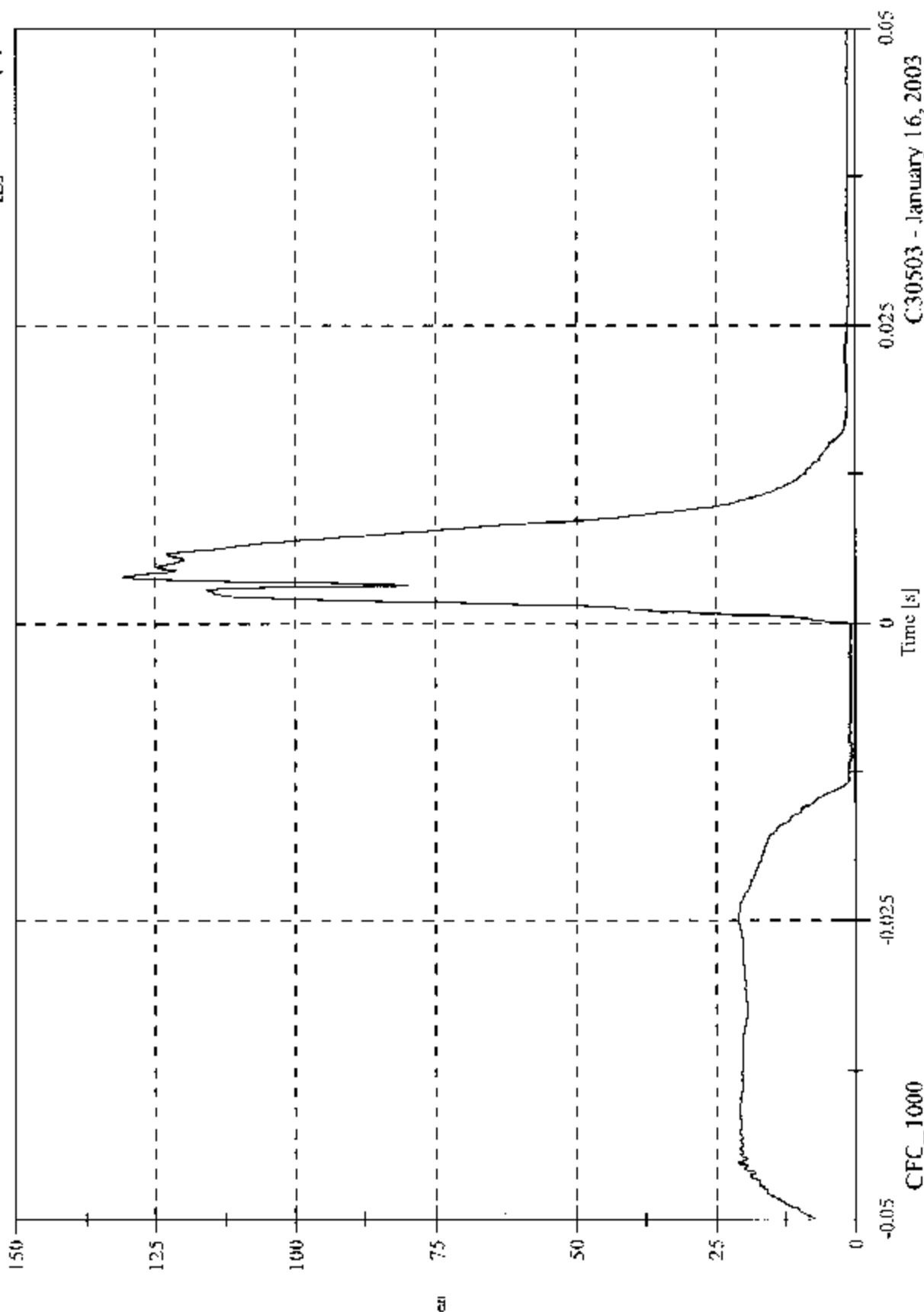
C30503 - January 16, 2003



# FMVSS 2010 IMPACT TLIST - 2003 HYUNDAI ELANTRA

Headform Resultant

Max: 131.1 [g] at 0.004 [s]  
Min: 0.3 [g] at -0.010 [s]



CFC\_1000

-0.025

Time [s]

0.025

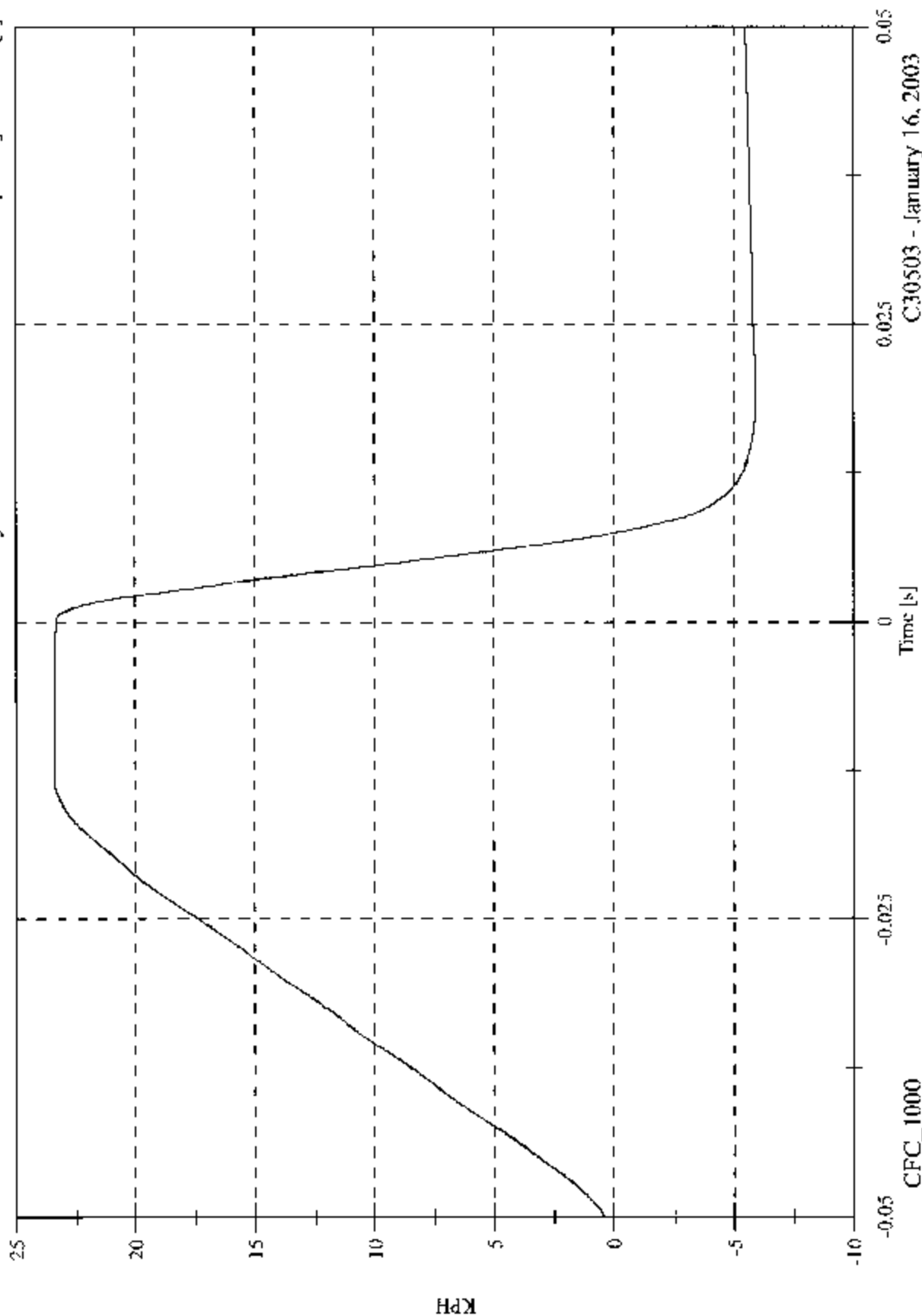
0.05

C30503 - January 16, 2003

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Velocity

Max: 23.4 [KPH] at -0.013 [s]  
Min: -5.9 [KPH] at 0.019 [s]

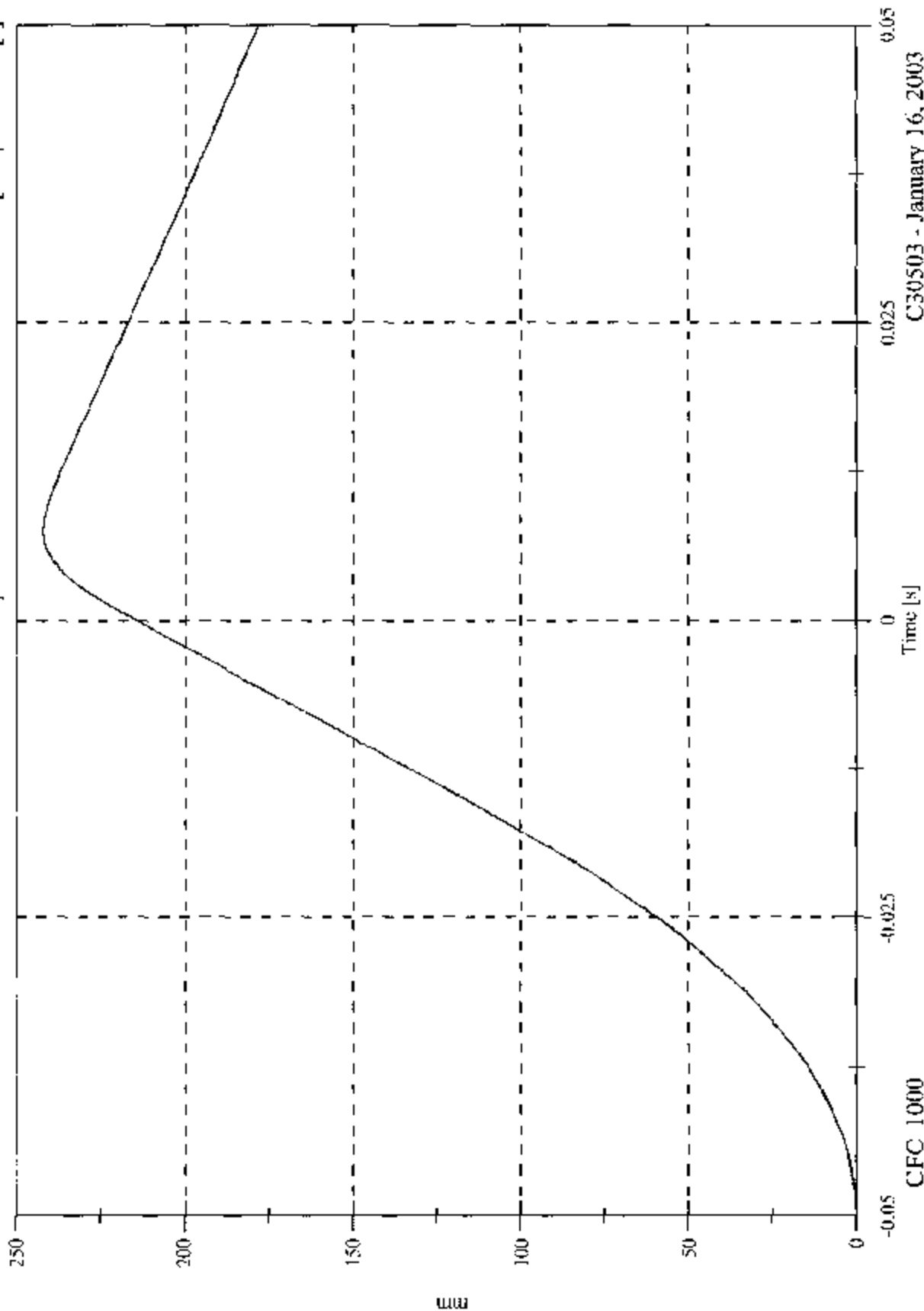


CFC\_1000

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 242.2 [mm] at 0.008 [s]  
 Min: 0.3 [mm] at -0.050 [s]

Headform Displacement



C30503 - January 16, 2003



Figure : PRE-TEST BP2

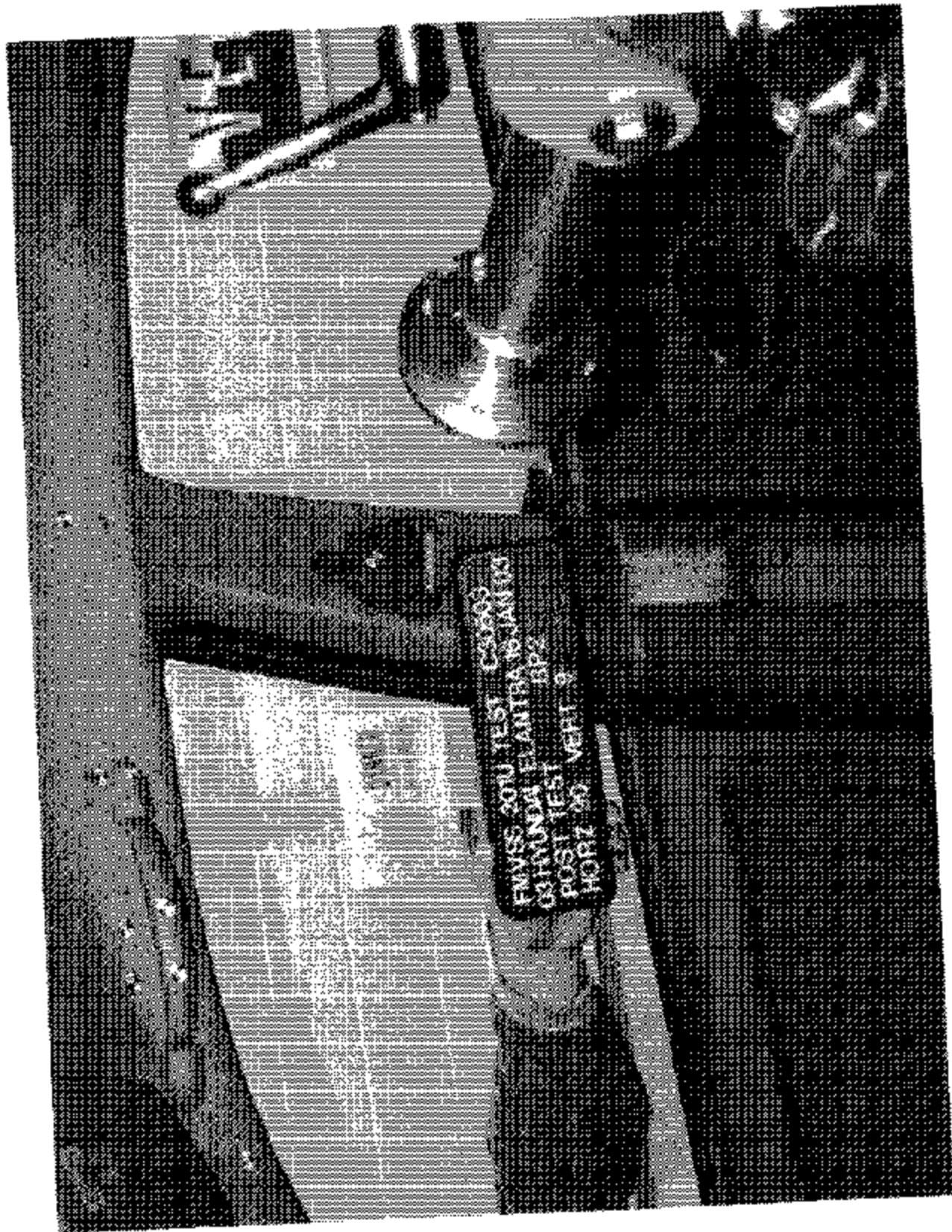


Figure : POST TEST BP2

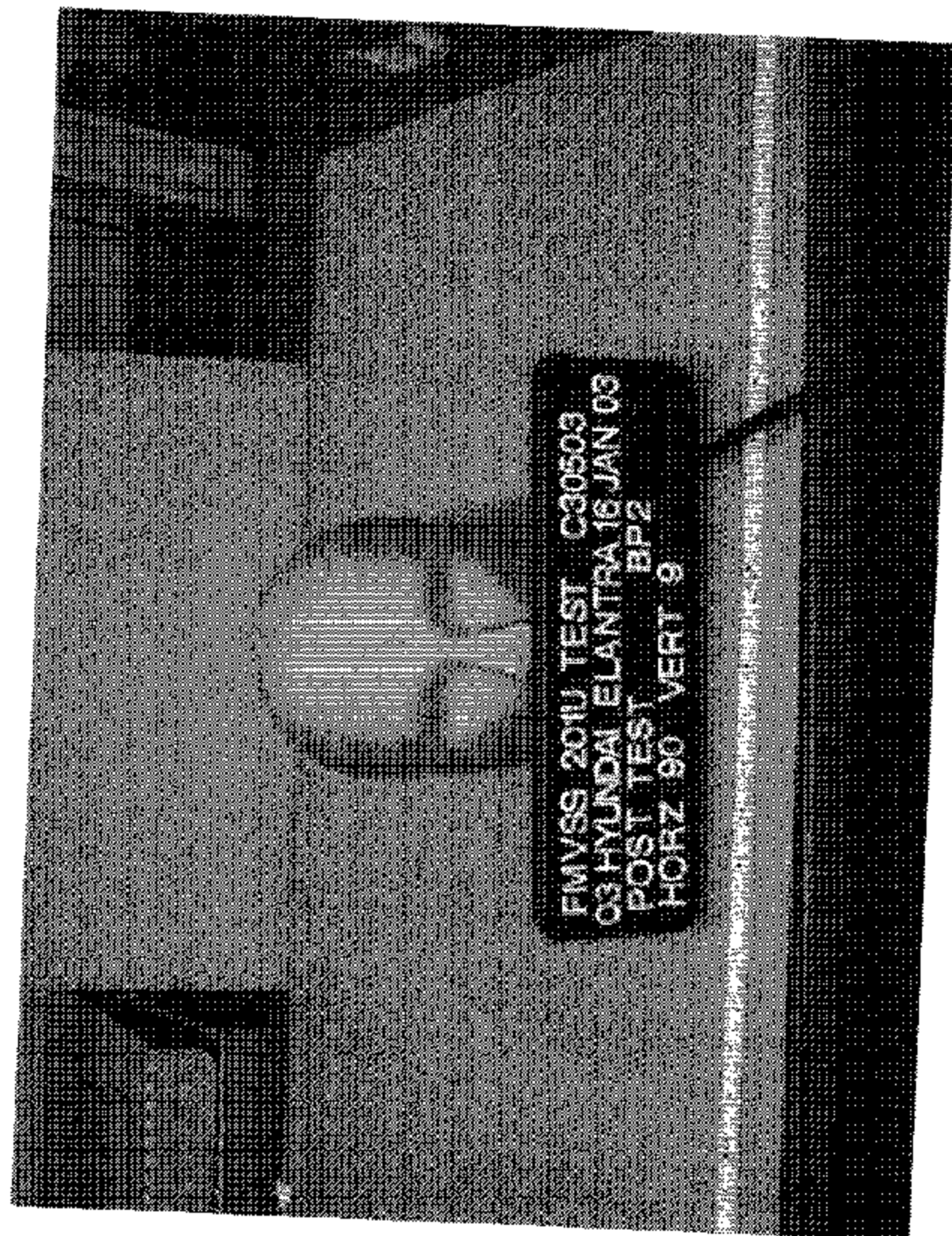


Figure : BP2 HEADFORM

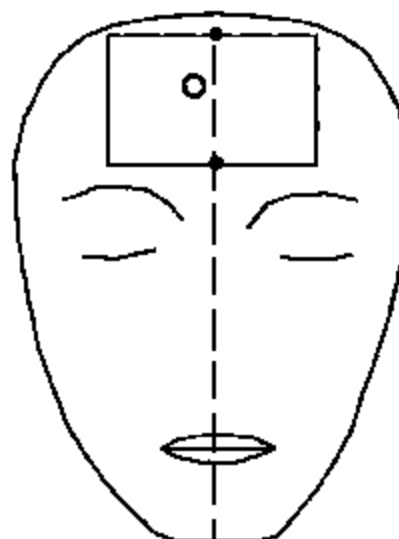
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHFN45D73U509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 5 Test Date: January 16, 2003  
 Target Location: Upper Roof - B-pillar Area Target Code: URBP  
 Horizontal Impact Angle: 90 ° Vertical Impact Angle: 42 °  
 Ambient Temperature: 21 °C Time of Impact: 2:45  
 Headform Number: 0355

# Impact Point:

Description:

|                                  |    |       |          |           |
|----------------------------------|----|-------|----------|-----------|
| Description: From lower midpoint |    |       |          |           |
| On centerline                    | 53 | mm up |          |           |
| On centerline                    | 4  | x     | mm right | - mm left |



Free Motion HIC: 602.4 HIC(d): 620.9  
 Impact Velocity (kph): 23.39 HIC1: 2.0 msec HIC2: 11.4 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - URBP

FMH Headform 0355

Location: URBP

Test Date: January 16, 2003

Work File: URBP

## -----TEST RESULTS-----

Lab Temperature: 21 C

HiCd: 620.9

Lab Humidity: 13 %

IIIC (36ms): 602.4

Velocity at Impact: 23.39 KPH

t1: 2.0 msec

t2: 11.4 msec

Free Flight Distance: 221.00 mm

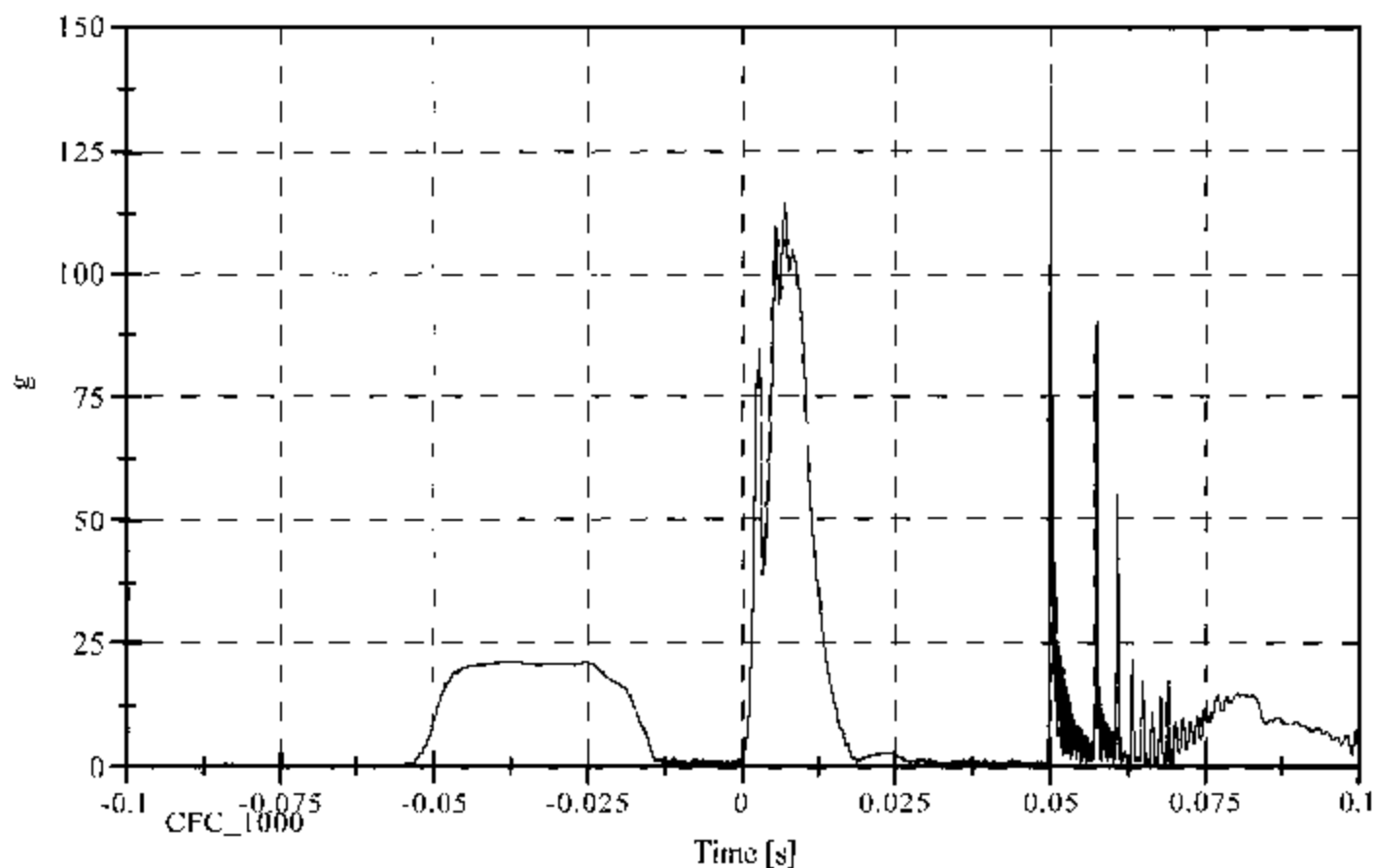
Duration: 9.4 msec

Average Acceleration: 10.9 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 137.9 [g] at 0.050 [s]

Min: 0.0 [g] at -0.095 [s]



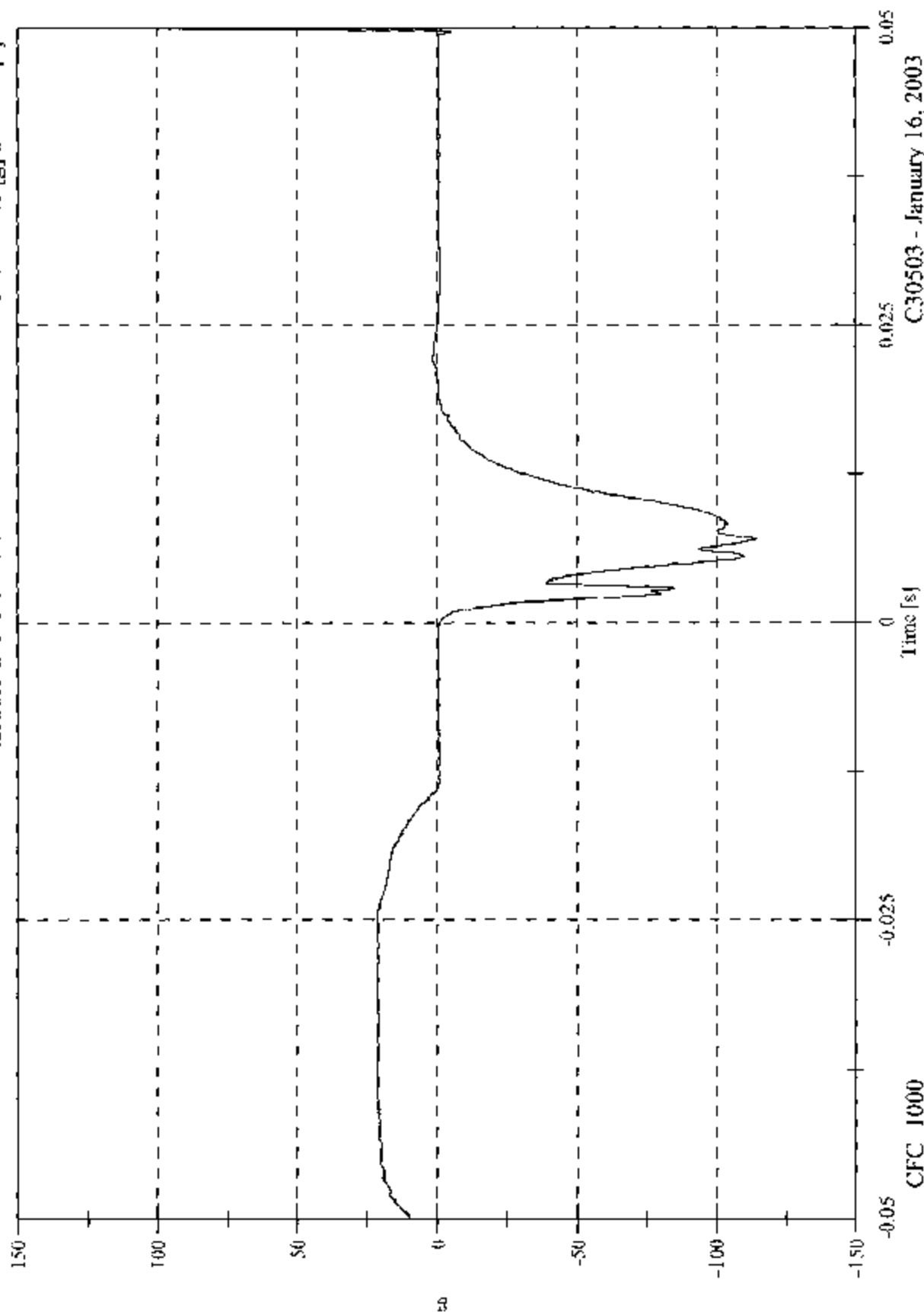


FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 125.5 [g] at 0.050 [s]

Min: -114.0 [g] at 0.007 [s]

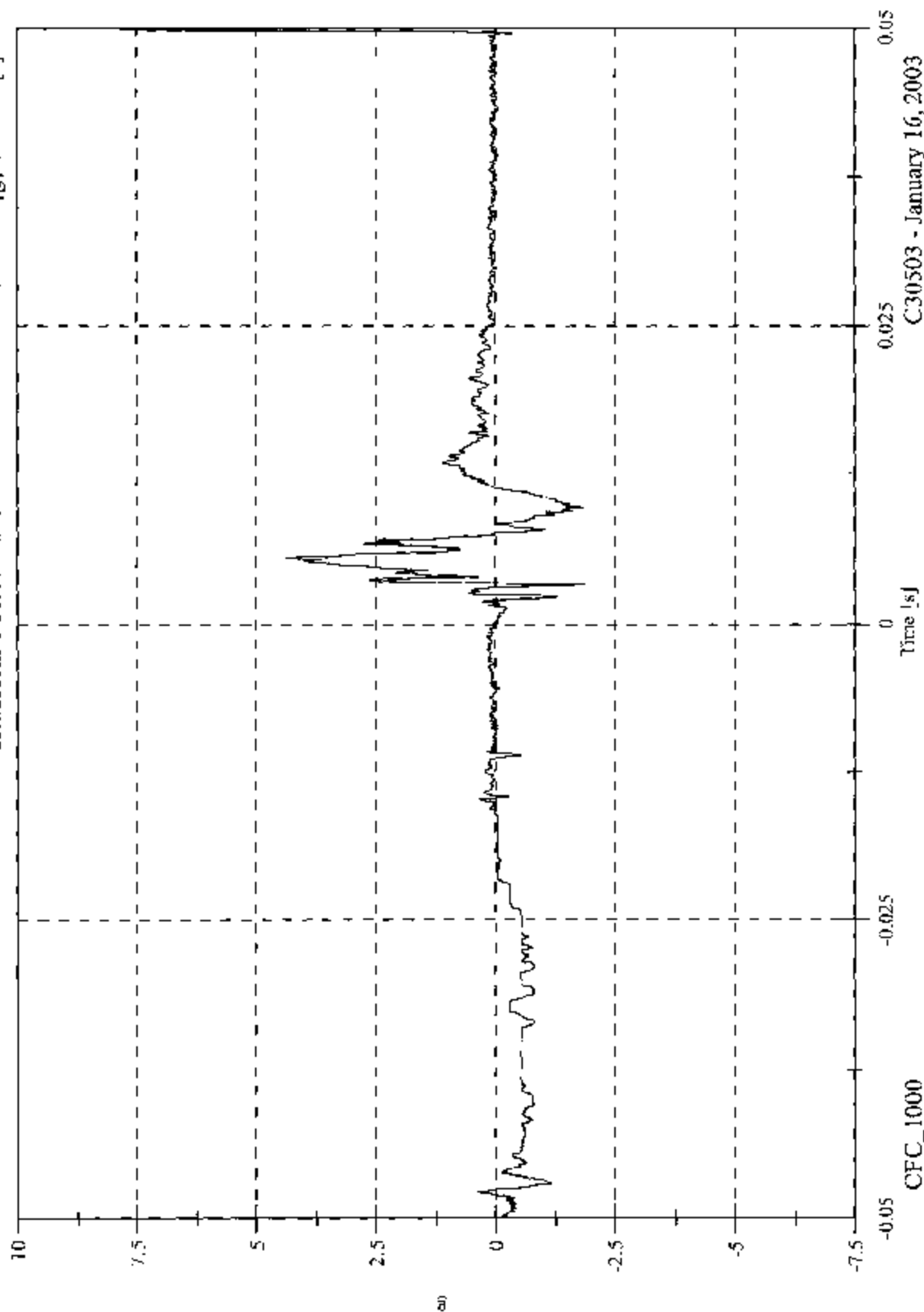


C30503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Y Acceleration

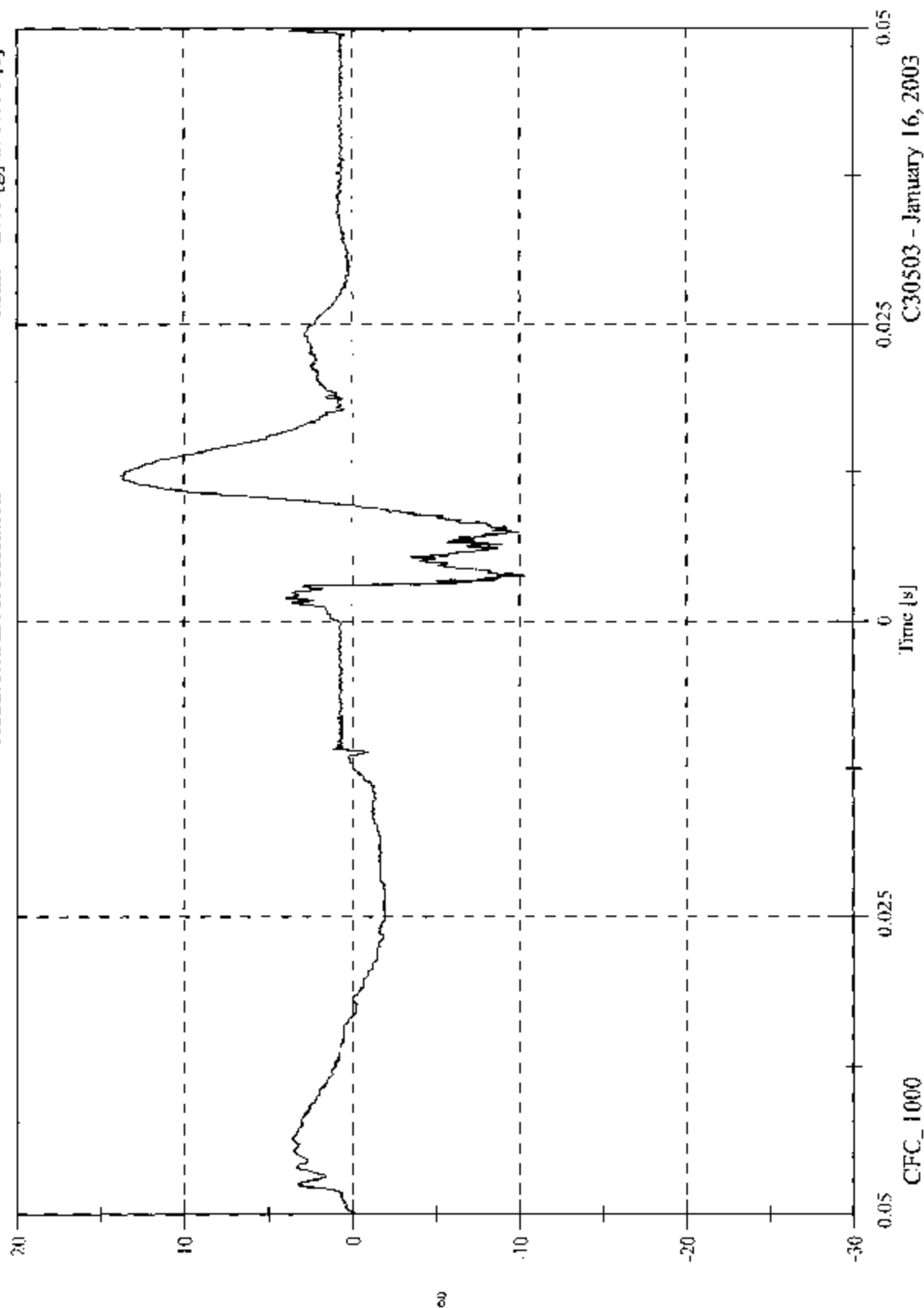
Max: 7.8 [g] at 0.050 [s]  
Min: -7.1 [g] at 0.050 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

Max: 13.8 [g] at 0.012 [s]  
Min: -27.6 [g] at 0.050 [s]

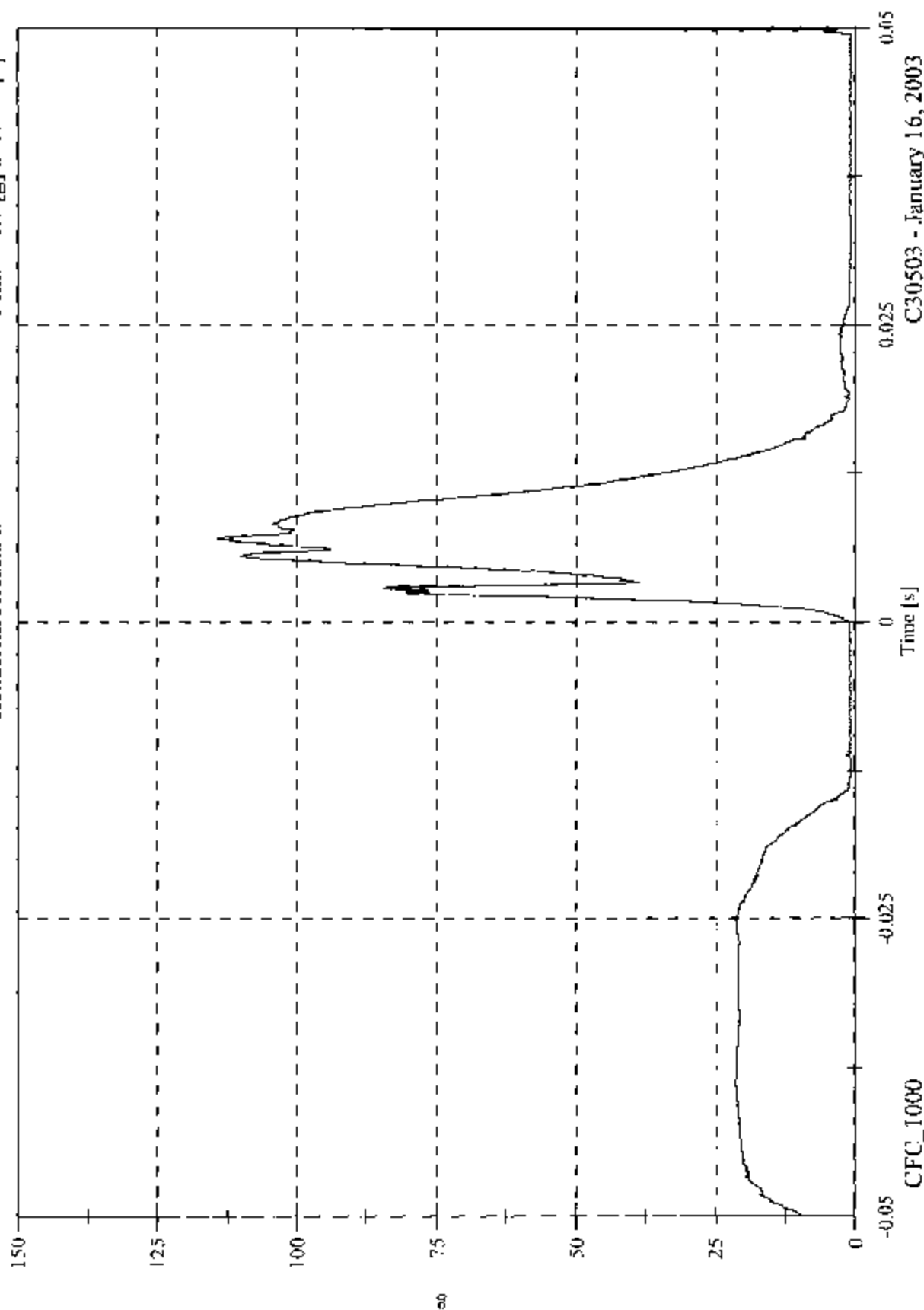


C30503 URBP IMPACT PLOT #3

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

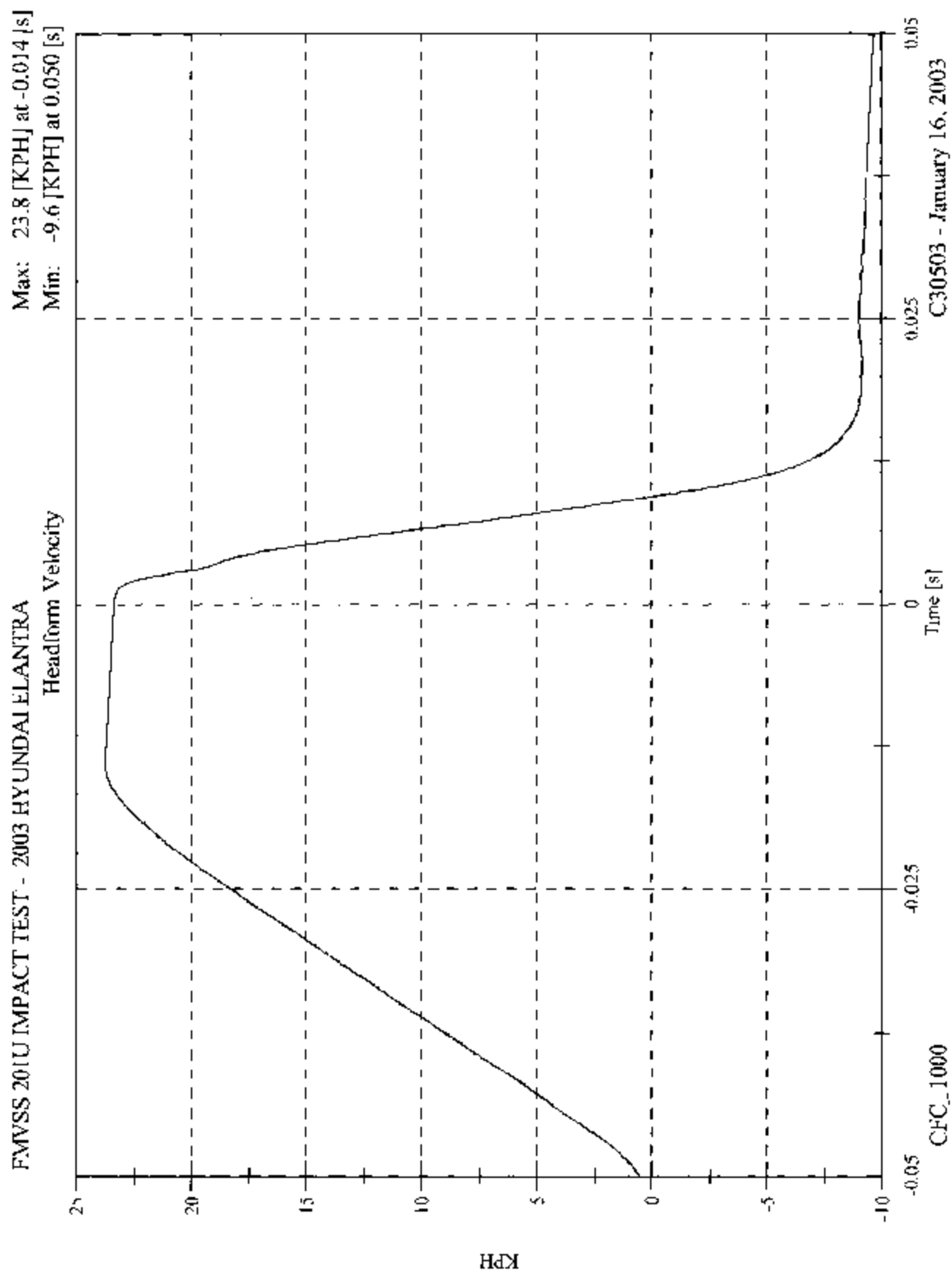
Headform Resultant

Max: 128.7 [g] at 0.050 [s]  
Min: 0.7 [g] at 0.046 [s]



C30503 - January 16, 2003

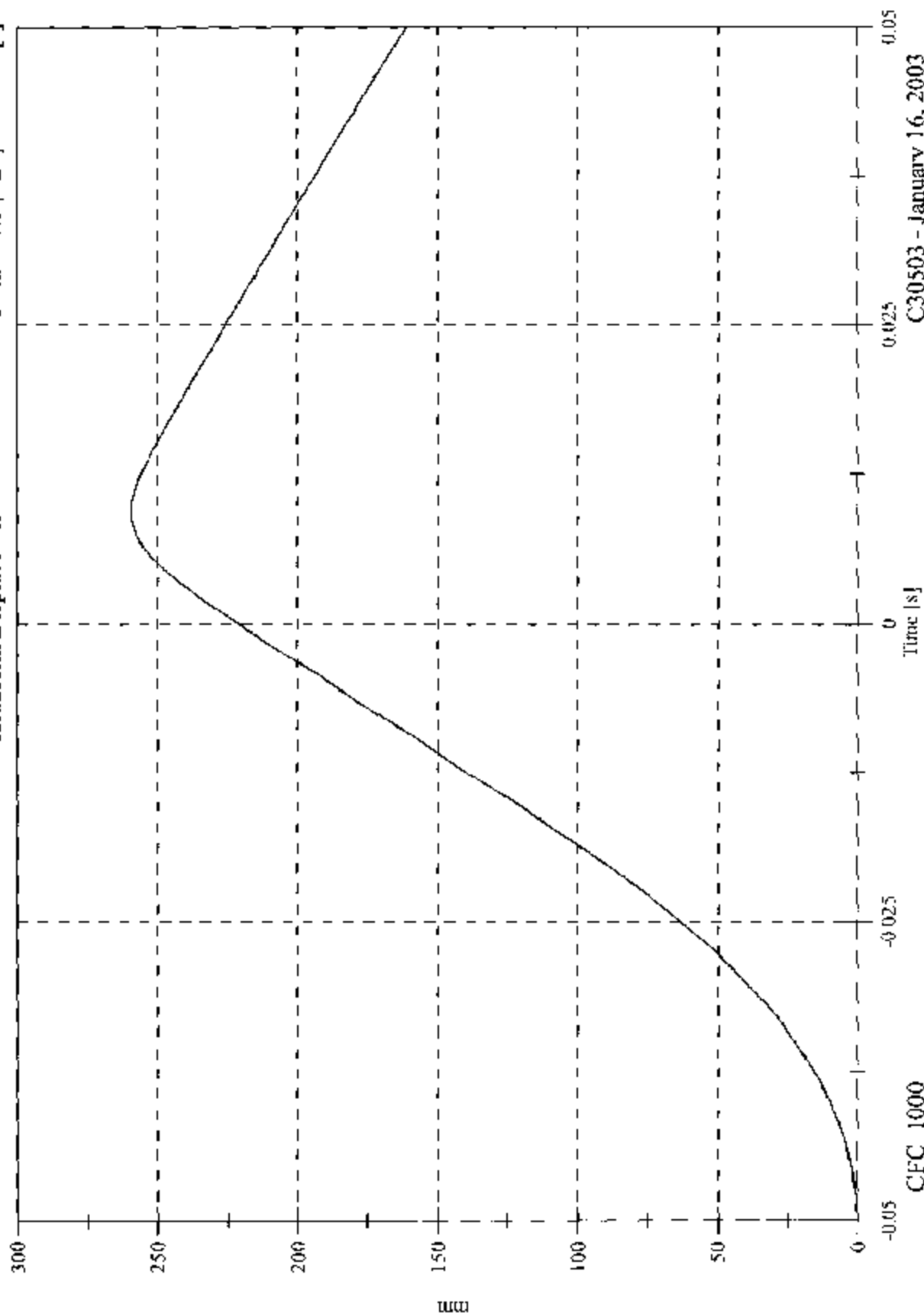
C30503 URBP IMPACT PLOT #5



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 259.4 [mm] at 0.009 [s]  
Min: 0.3 [mm] at -0.050 [s]

Headform Displacement



C30503 - January 16, 2003

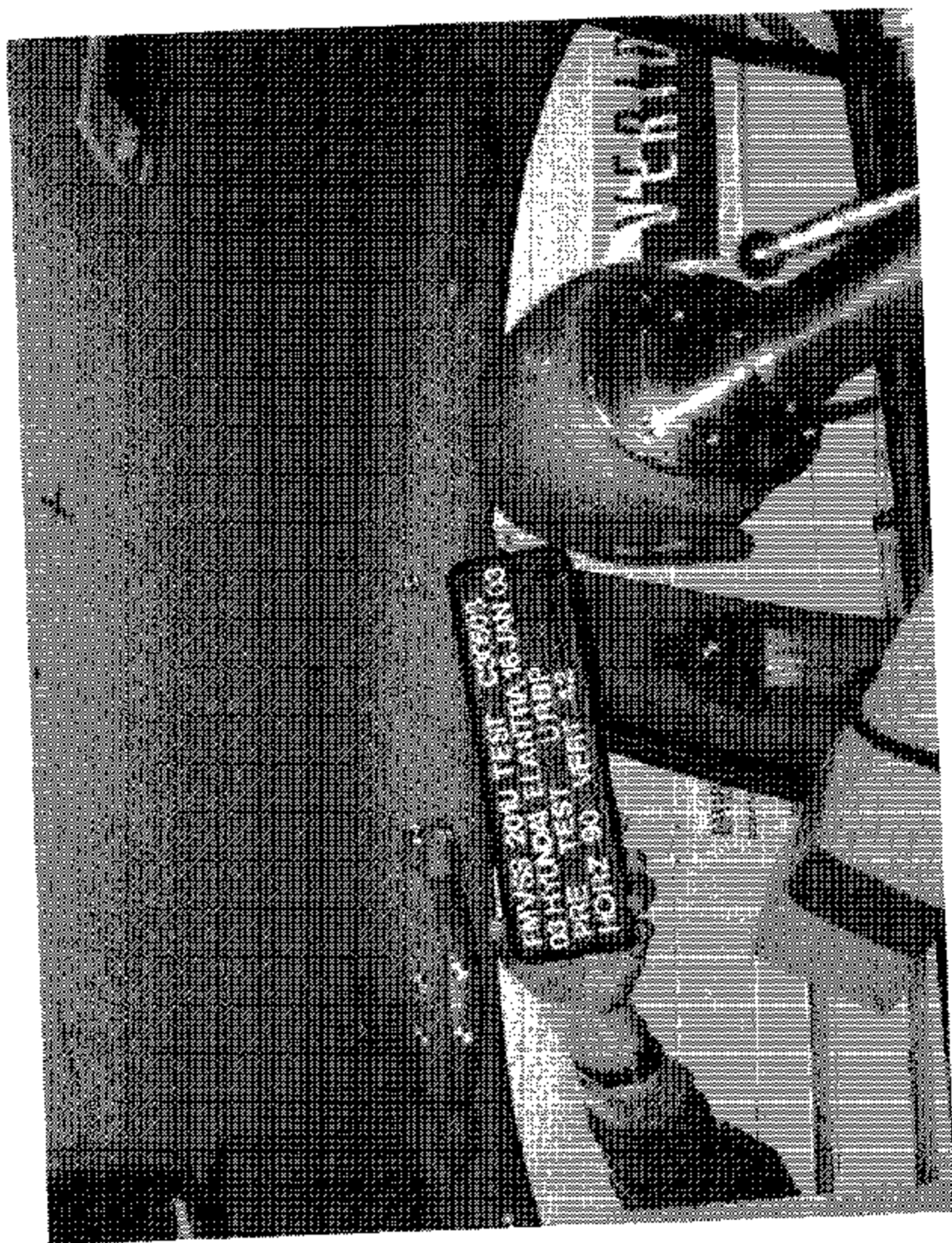


Figure - PRE-TEST UMBP

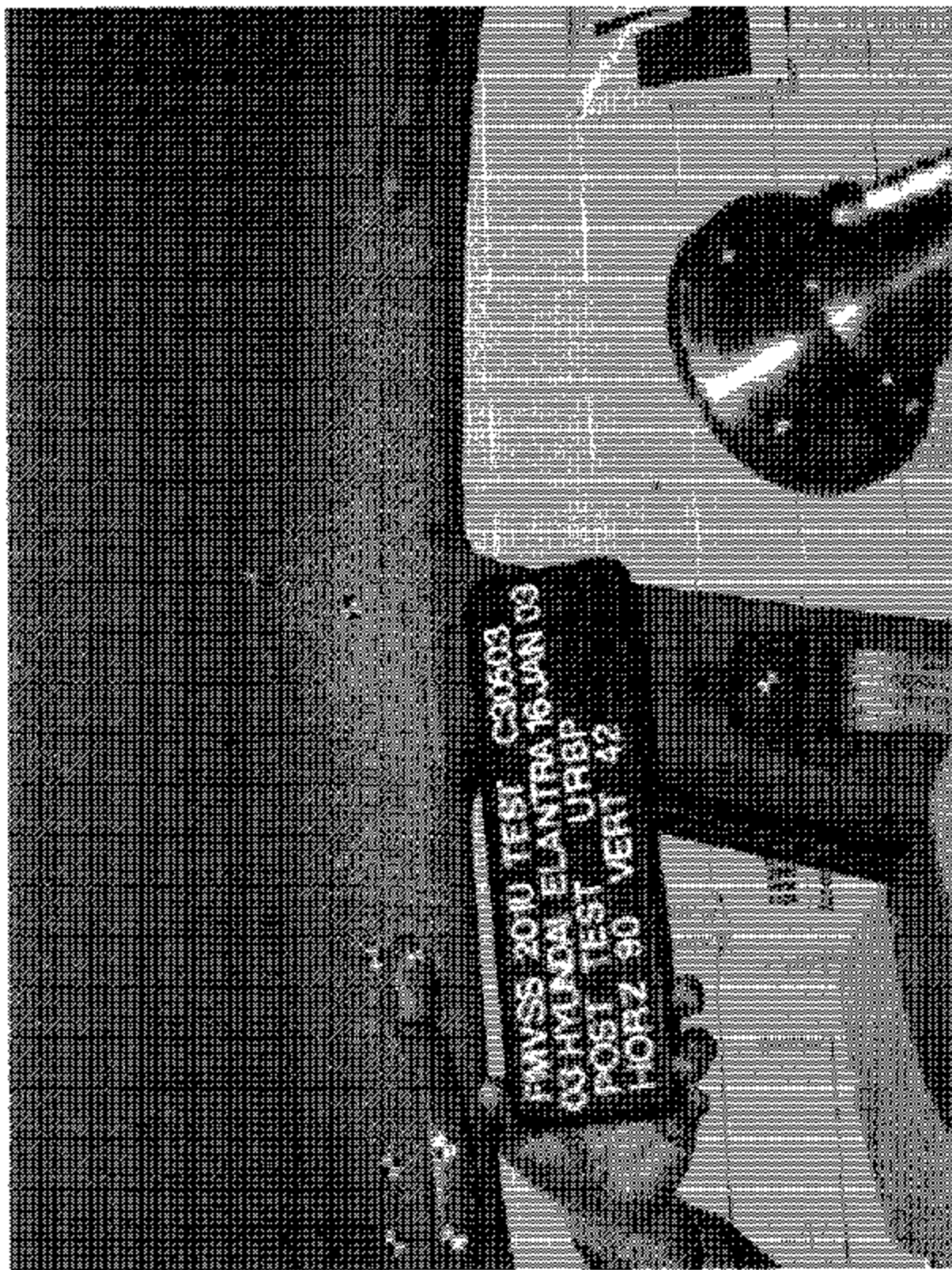


Figure 1 POST-TEST URBP



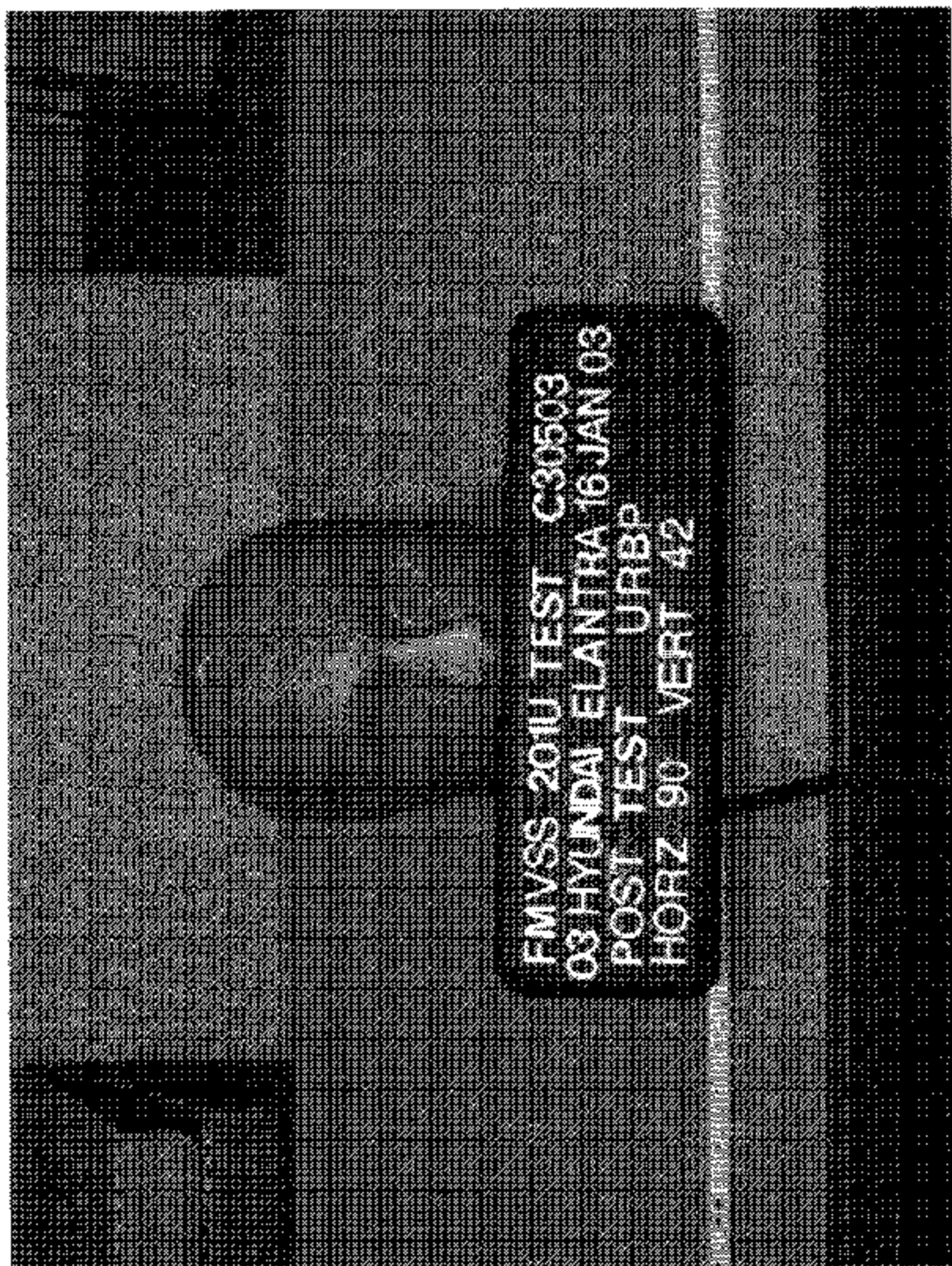


Figure : URBP HEADFORM

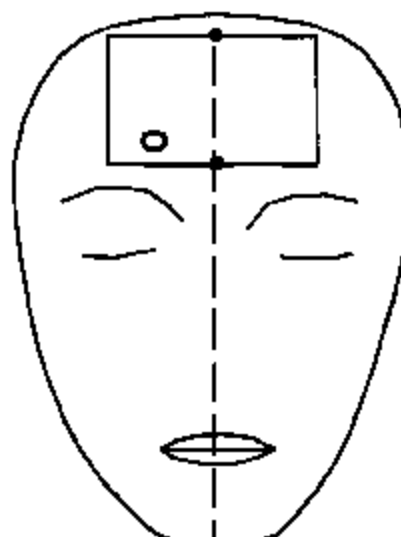
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMH1DN45D73U509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 6 Test Date: January 16, 2003  
 Target Location: A-pillar Target Code: AP1  
 Horizontal Impact Angle: 116 ° Vertical Impact Angle: 33 °  
 Ambient Temperature: 21 °C Time of Impact: 3:30  
 Headform Number: 1255

### Impact Point:

Description:

|                                  |    |       |          |           |
|----------------------------------|----|-------|----------|-----------|
| Description: From lower midpoint |    |       |          |           |
| On centerline                    | 14 | mm up |          |           |
| On centerline                    | 24 | x     | mm right | - mm left |



Free Motion HIC: 904.0 HIC(d): 848.4  
 Impact Velocity (kph): 23.60 HIC1: 4.1 msec HIC2: 7.8 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - AP1

FMH Headform 1255

Location: AP1

Test Date: January 16, 2003

Work File: AP1

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 848.4

Lab Humidity: 13 %

HIC (36ms): 904.0

Velocity at Impact: 23.59 KP11

t1: 4.1 msec

t2: 7.8 msec

Free Flight Distance: 216.72 mm

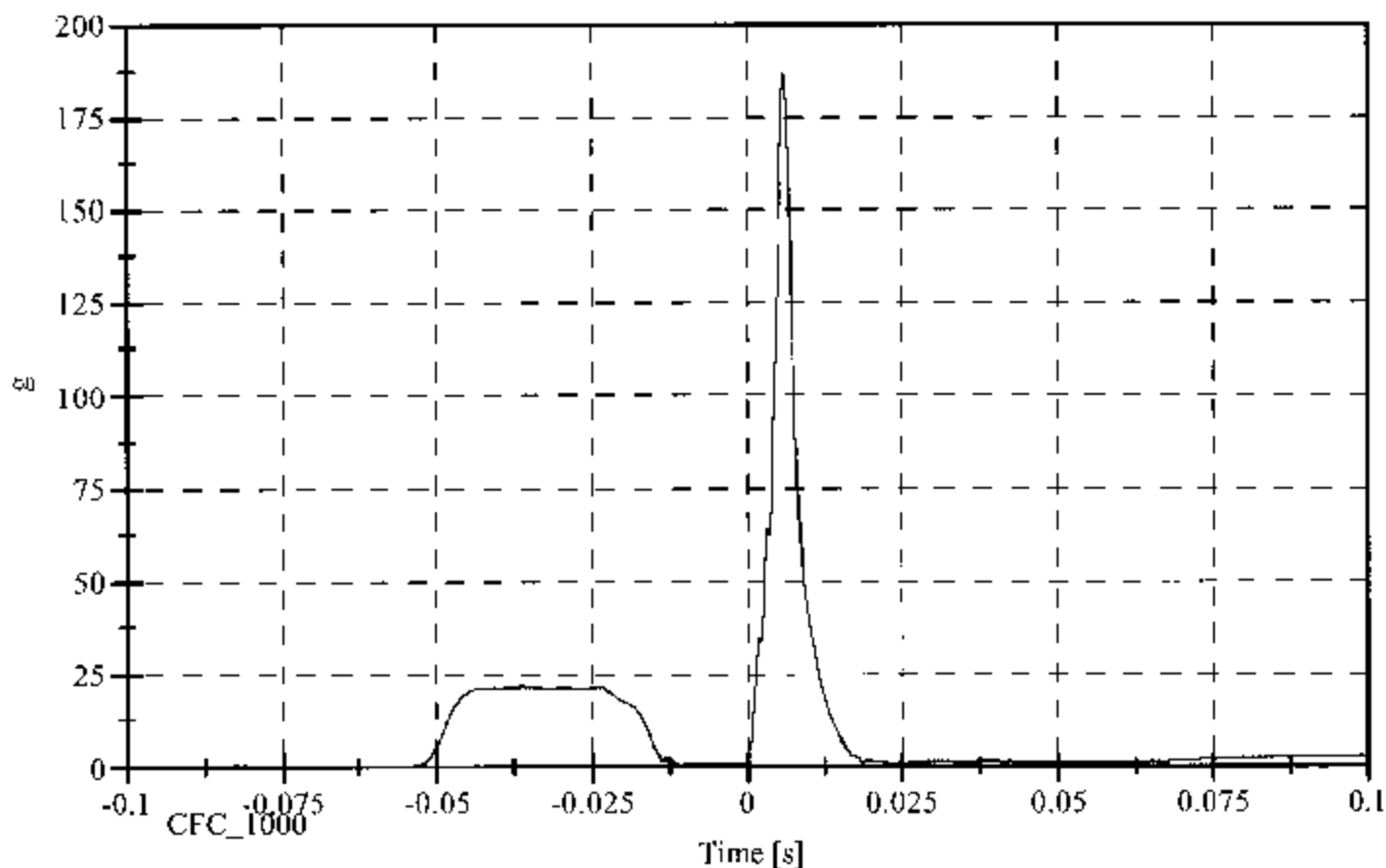
Duration: 3.8 msec

Average Acceleration: 8.8 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 186.7 [g] at 0.006 [s]

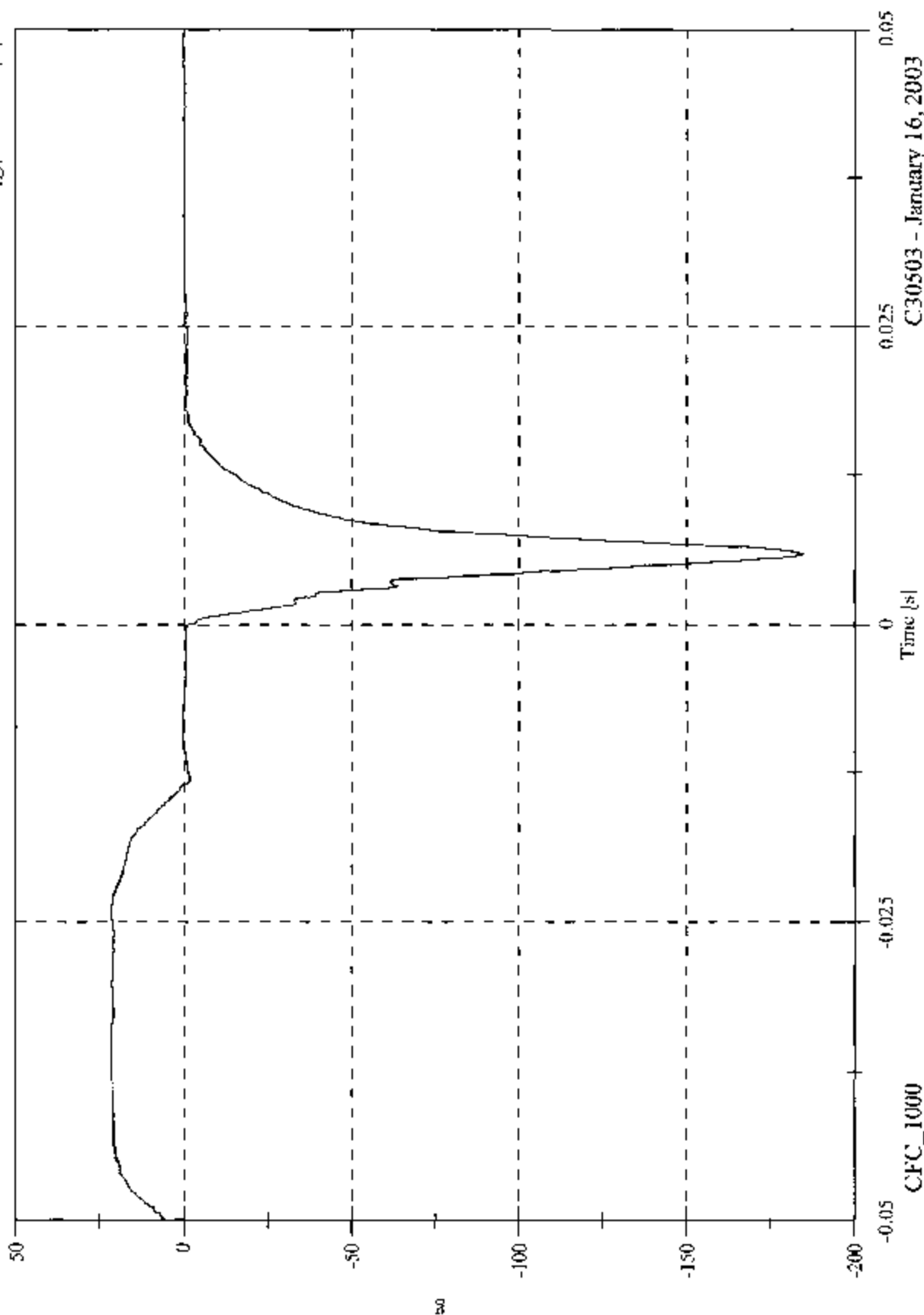
Min: 0.0 [g] at -0.092 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI FLANTRA

Max: 21.9 [g] at -0.036 [s]  
Min: -184.2 [g] at 0.006 [s]

Headform X Acceleration



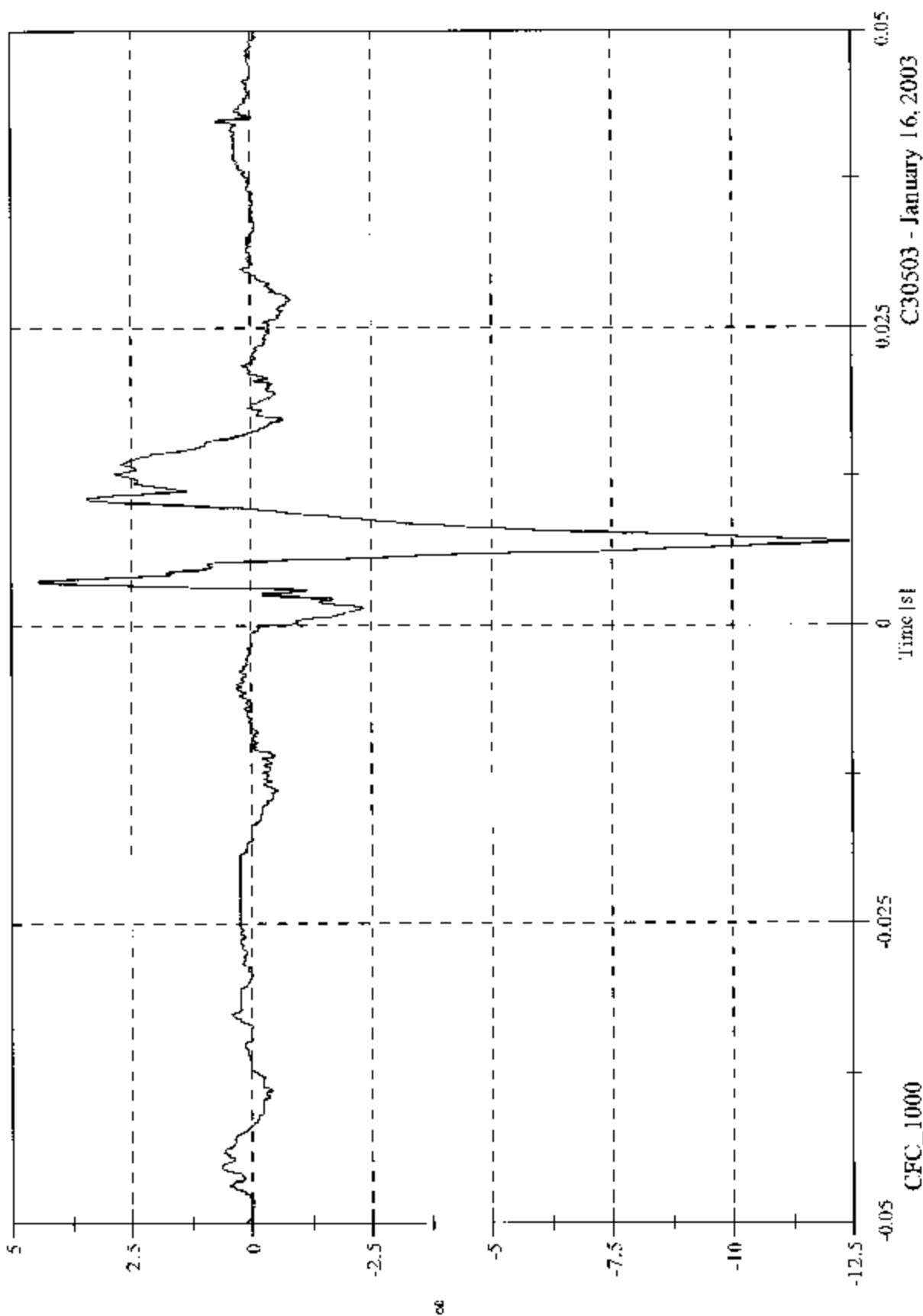
C30503 - January 16, 2003

IMVSS 201U IMPACT TEST - 2003 IYUNDAI ELANTRA

Ileadform Y Acceleration

Max: 4.4 [g] at 0.004 [s]

Min: -12.4 [g] at 0.007 [s]



CFC\_1000

-0.025

Time [s]

0.025

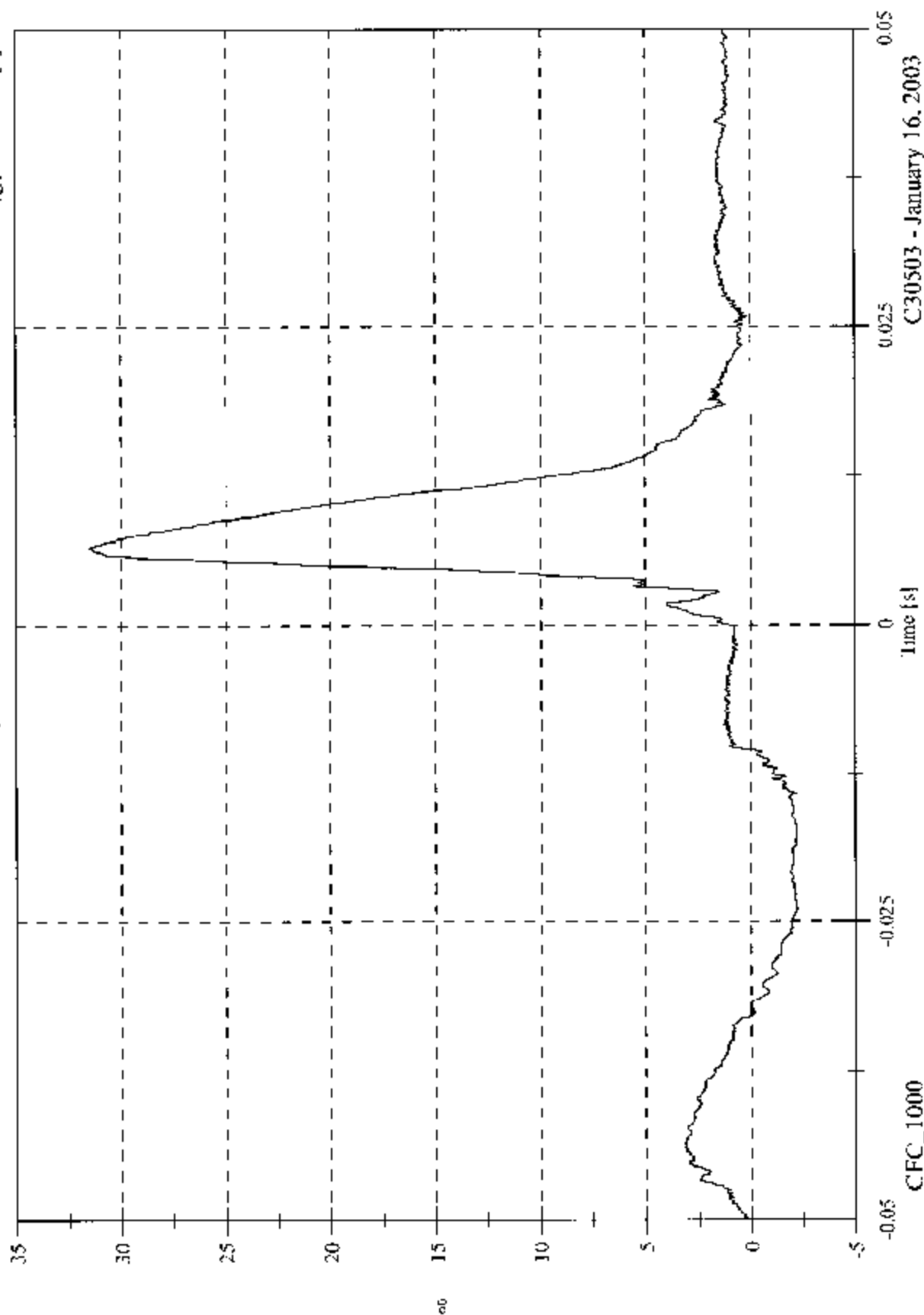
0.05

C30503 - January 16, 2003

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

Max: 31.5 [g] at 0.007 [s]  
Min: -2.2 [g] at -0.024 [s]

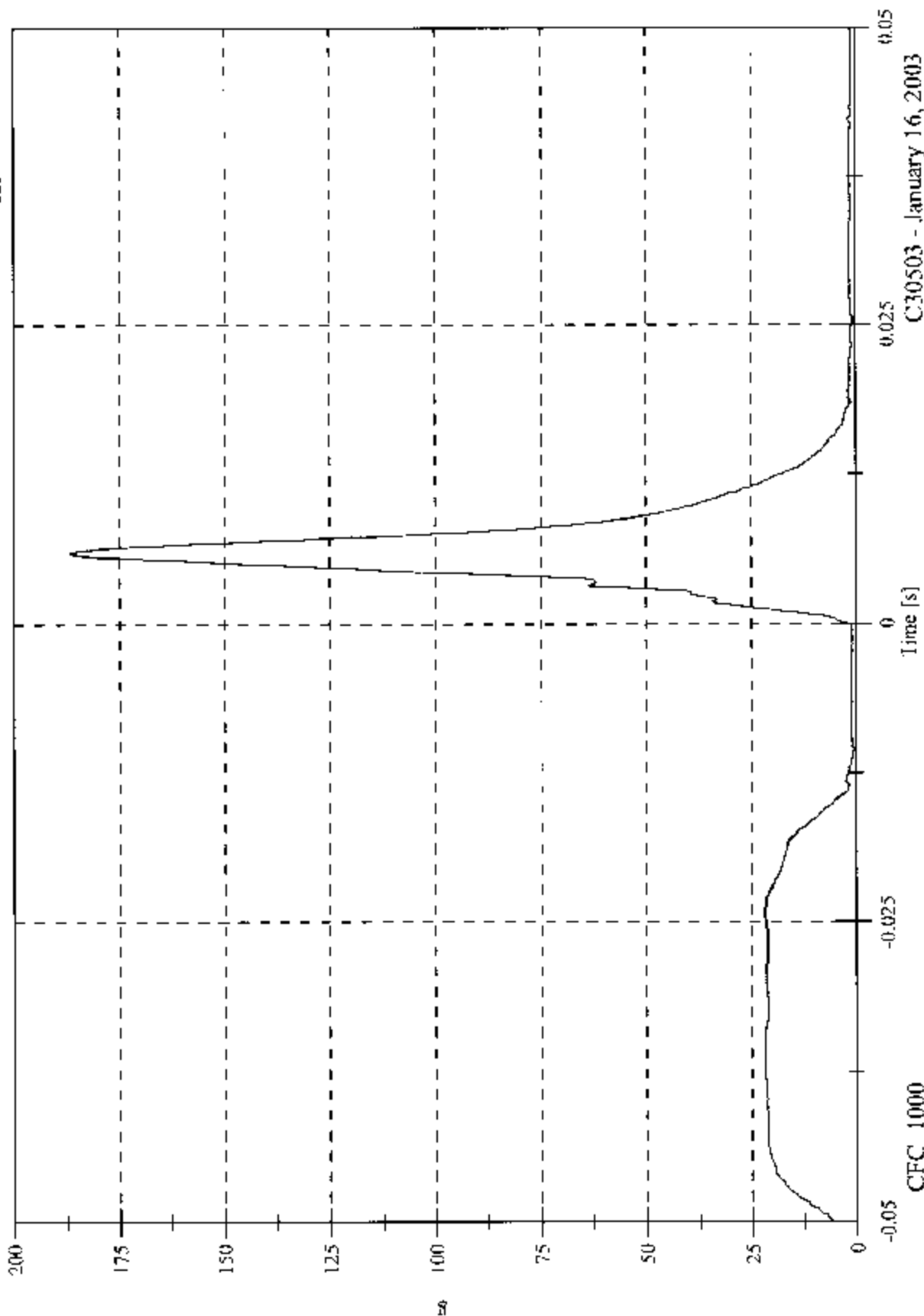


C30503 - January 16, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Resultant

Max: 186.7 [g] at 0.006 [s]  
Min: 0.3 [g] at -0.011 [s]

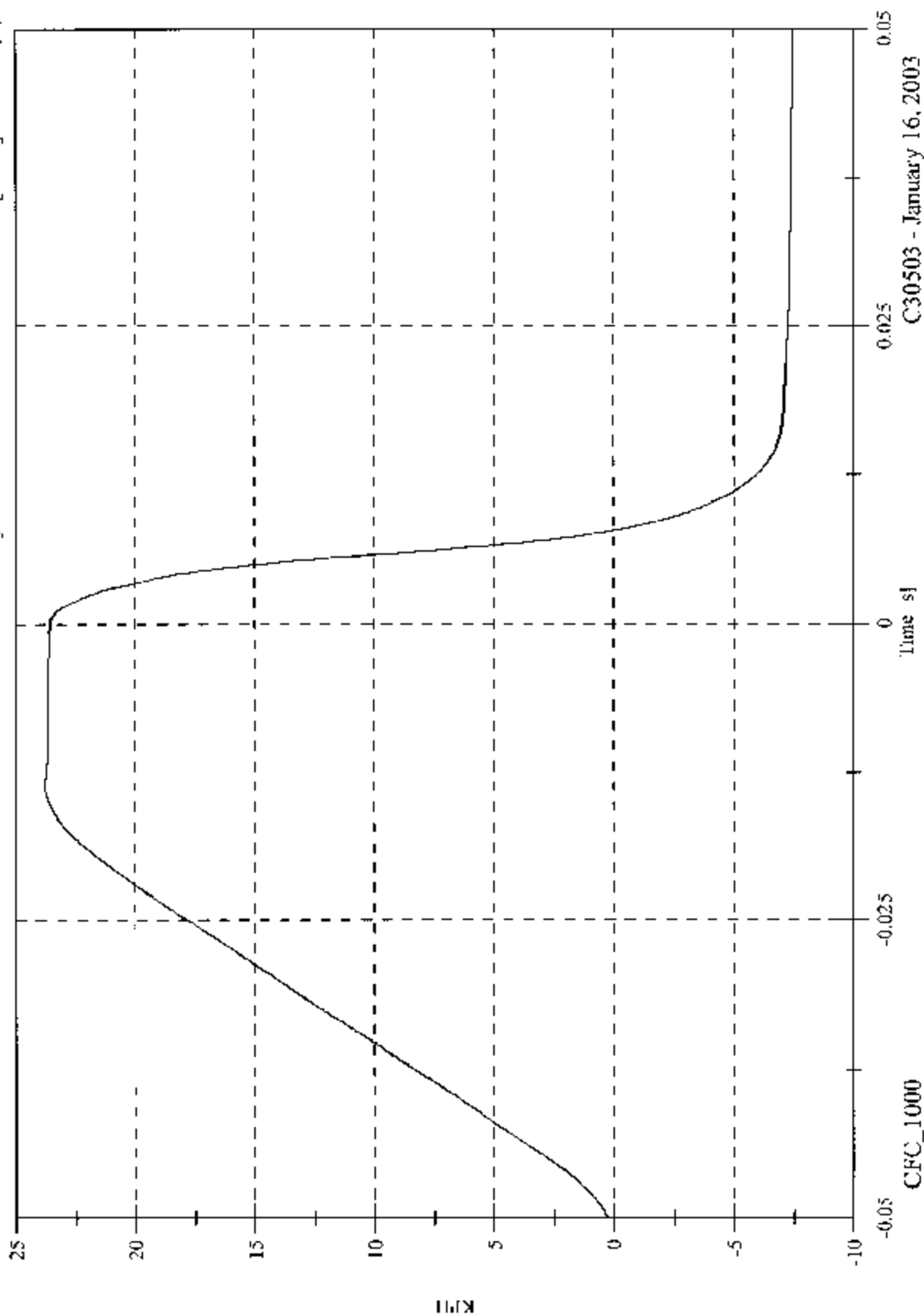


C30503 - January 16, 2003

# FMVSS 2010 IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Velocity

Max: 23.8 [KPH] at -0.013 [s]  
Min: -7.4 [KPH] at 0.047 [s]



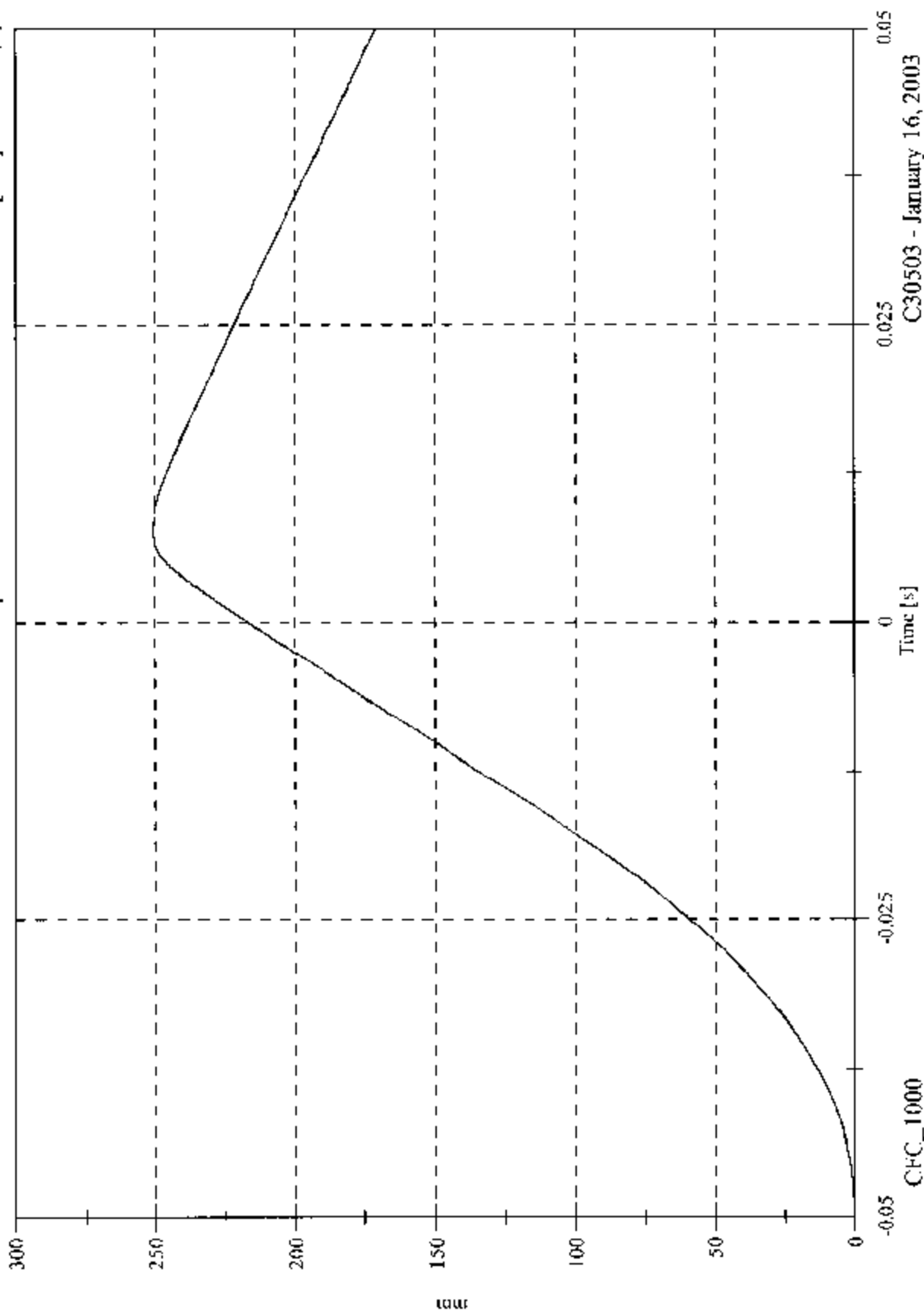
C30503 - January 16, 2003



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI FLANTRA

Headform Displacement

Max: 251.0 [mm] at 0.008 [s]  
Min: 0.2 [mm] at -0.050 [s]



C30503 - January 16, 2003

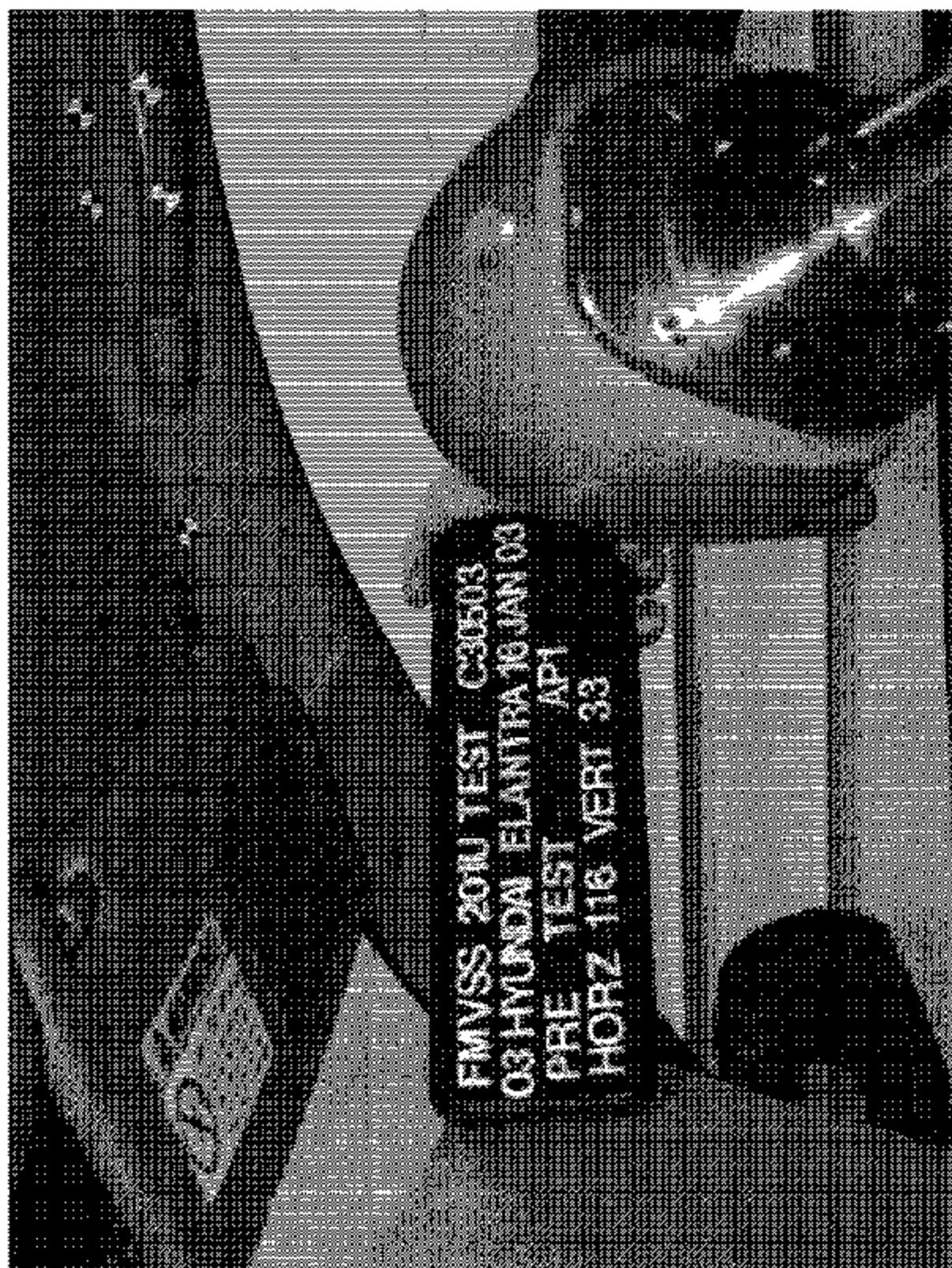


Figure : PRE-TEST API

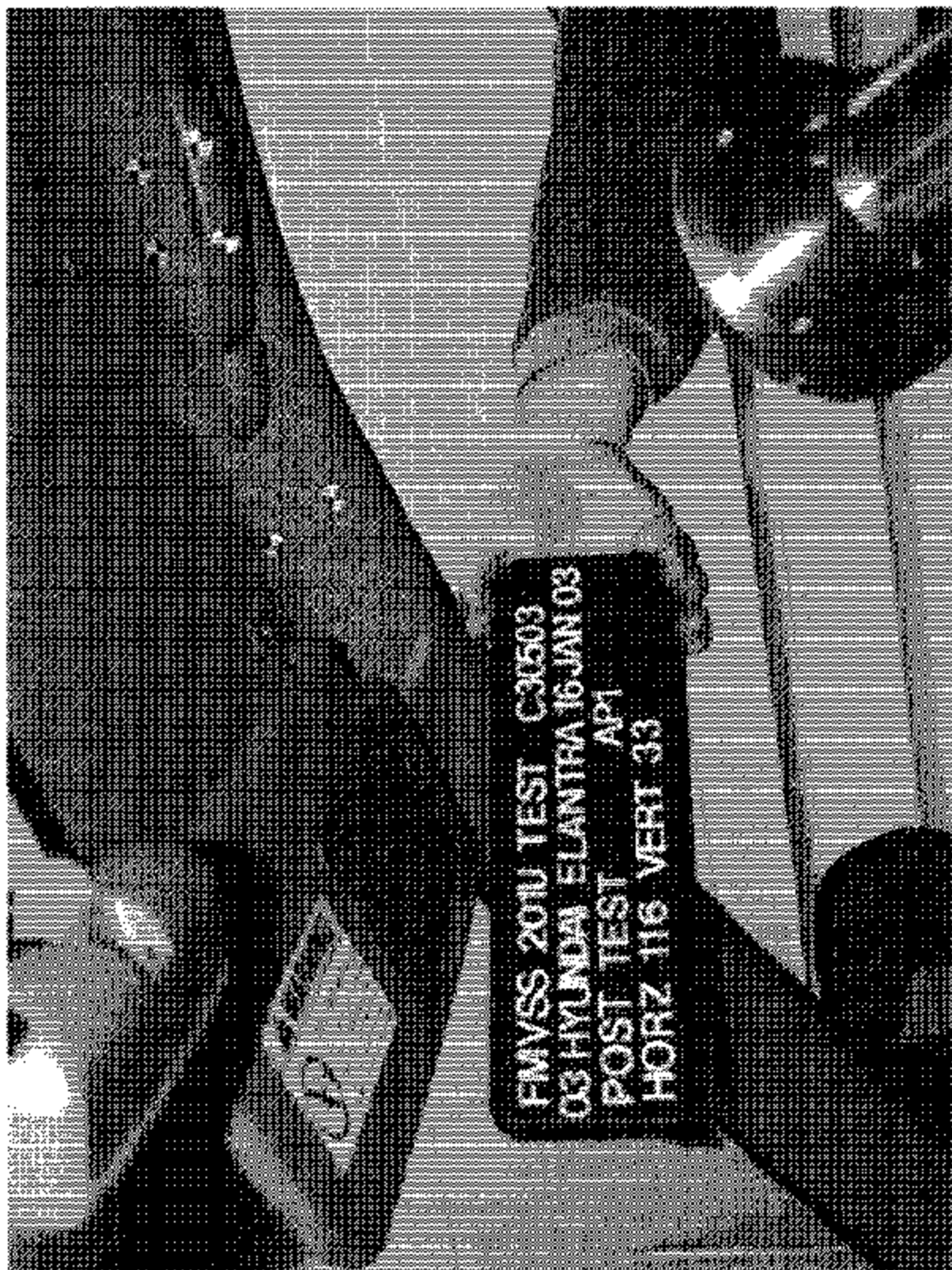


Figure : POST-TEST AP1



Figure : API HEADFORM

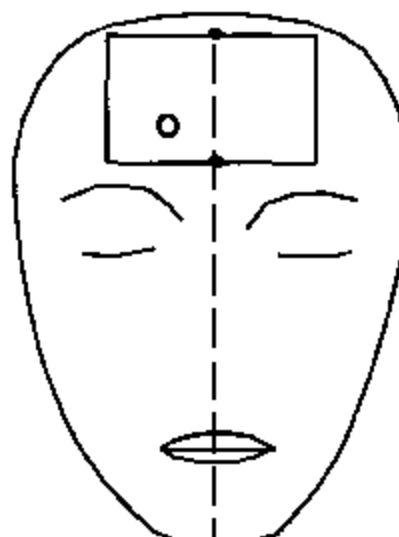
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
Vehicle Body Color: Black VIN: KMHIDN45D73U509422  
Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 7 Test Date: January 17, 2003  
Target Location: Rear Side Rail Grab Handle Target Code: SR3B  
Horizontal Impact Angle: 270 ° Vertical Impact Angle: 50 °  
Ambient Temperature: 21 °C Time of Impact: 9:20  
Headform Number: 1255

### Impact Point:

Description:

|               |                     |       |          |   |         |
|---------------|---------------------|-------|----------|---|---------|
| Description:  | From lower midpoint |       |          |   |         |
| On centerline | 19                  | mm up |          |   |         |
| On centerline | 13                  | x     | mm right | - | mm left |



Free Motion HIC: 896.5 HIC(d): 842.8  
Impact Velocity (kph): 23.76 HIC1: 1.6 msec HIC12: 8.3 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - SR3B

FMH Headform 1255

Location: SR3B

Test Date: January 17, 2003

Work File: SR3B

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 842.8

Lab Humidity: 13 %

IIIC (36ms): 896.5

Velocity at Impact: 23.76 KPH

t1: 1.6 msec

t2: 8.3 msec

Free Flight Distance: 214.13 mm

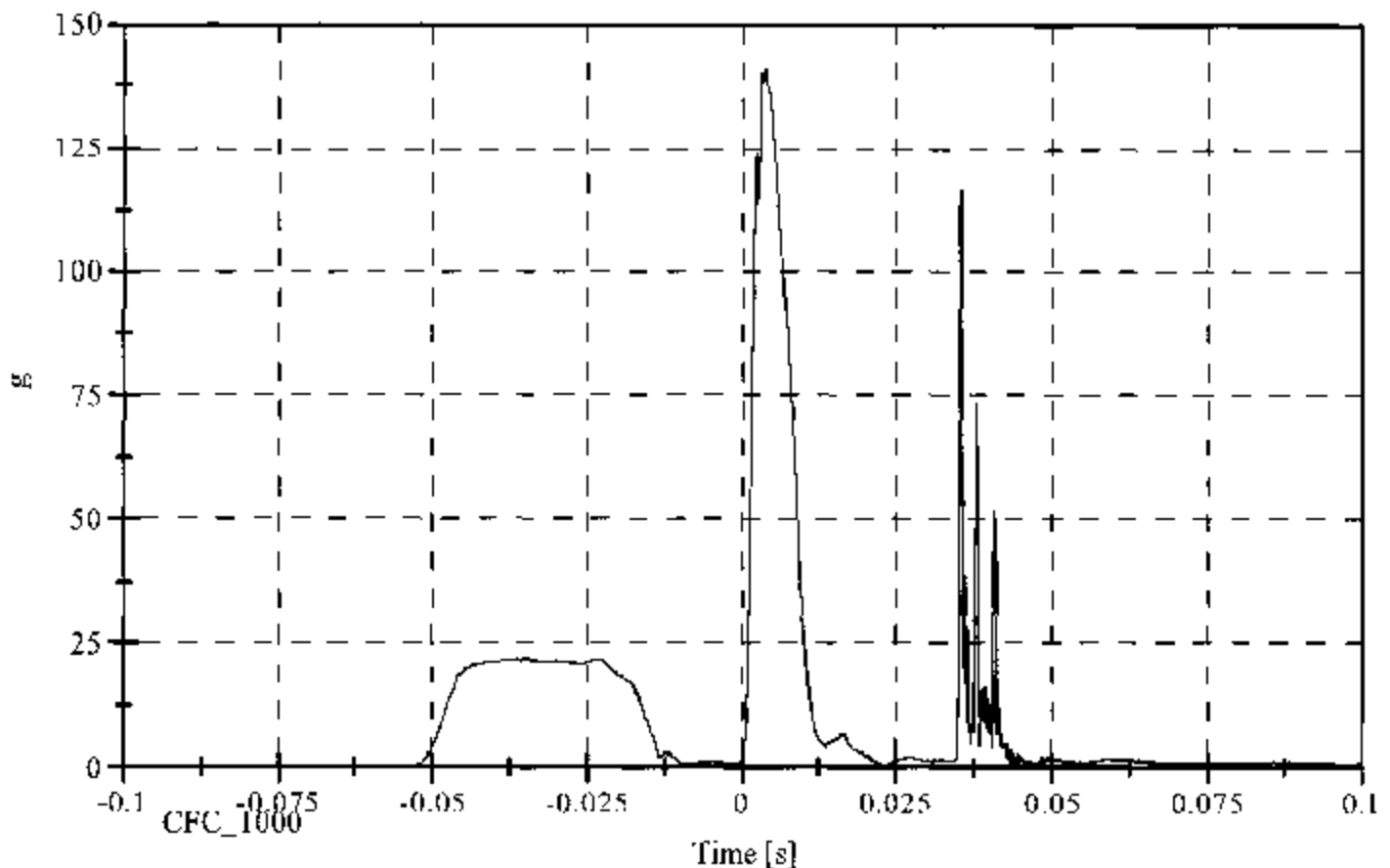
Duration: 6.7 msec

Average Acceleration: 9.6 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 141.1 [g] at 0.004 [s]

Min: 0.0 [g] at -0.094 [s]

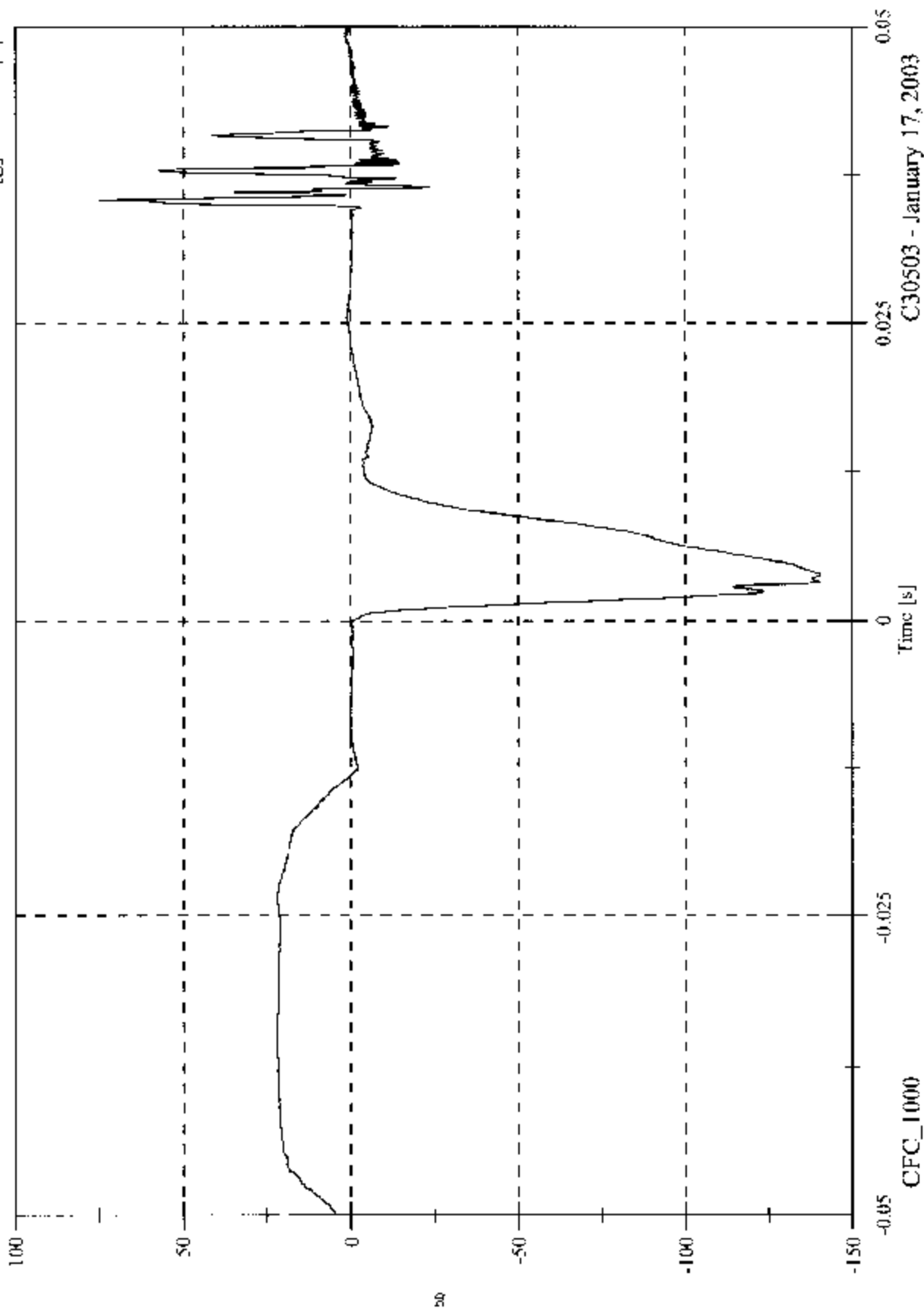


# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 75.2 [g] at 0.035 [s]

Min: -140.5 [g] at 0.004 [s]

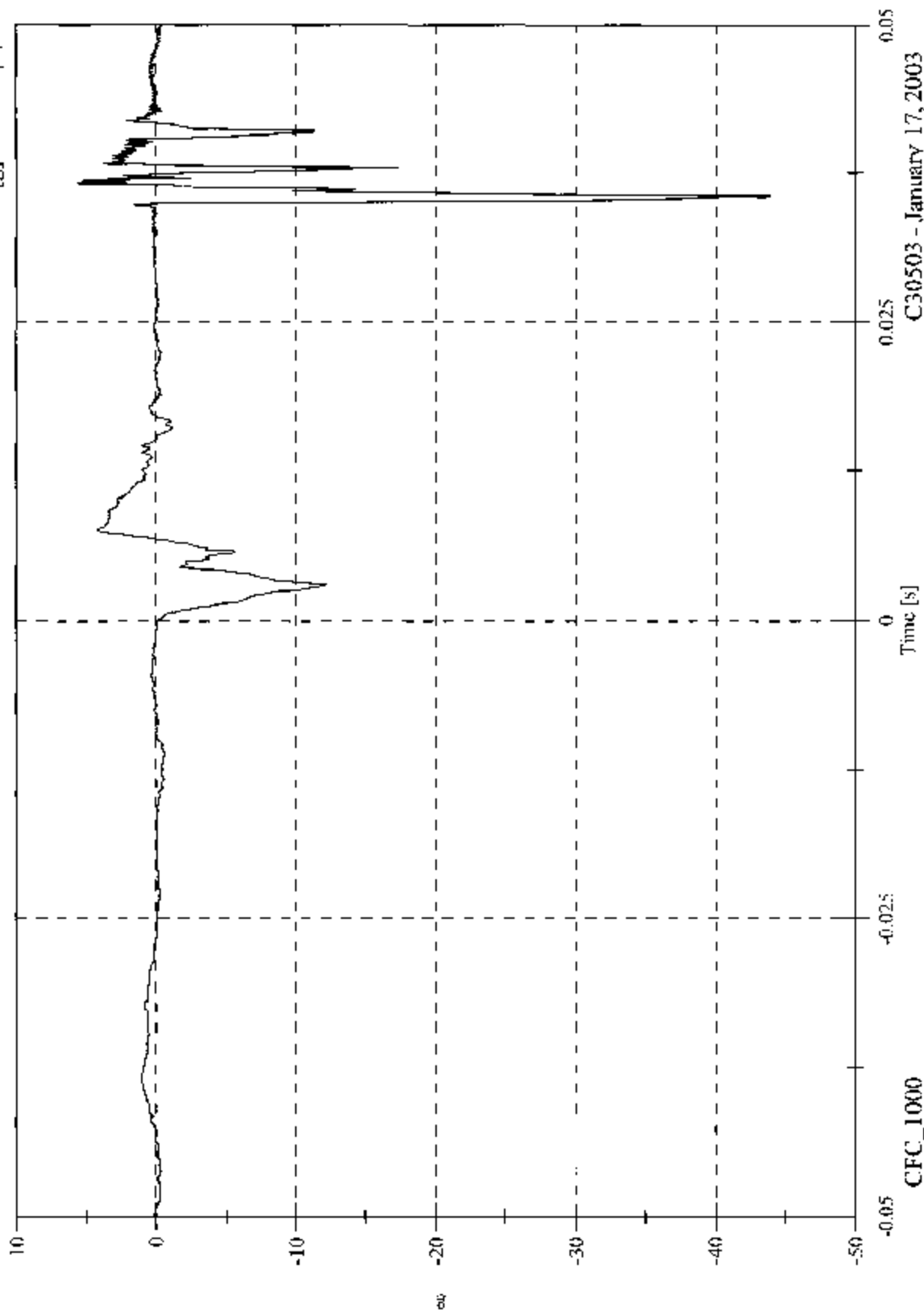


C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 5.7 [g] at 0.037 [s]  
Min: -43.9 [g] at 0.036 [s]

Headform Y Acceleration



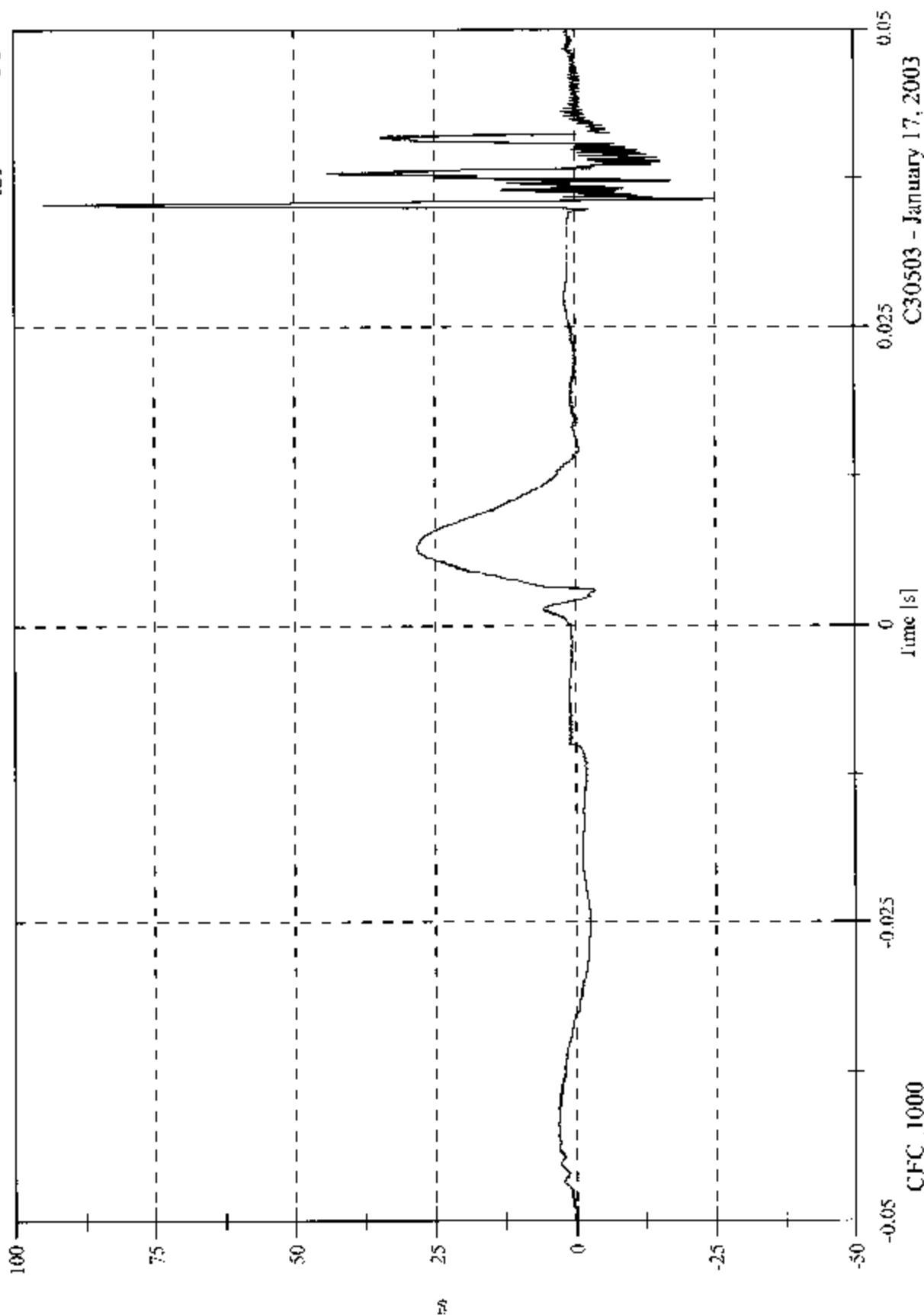
C30503 - January 17, 2003



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

Max: 95.1 [g] at 0.035 [s]  
Min: -25.1 [g] at 0.036 [s]



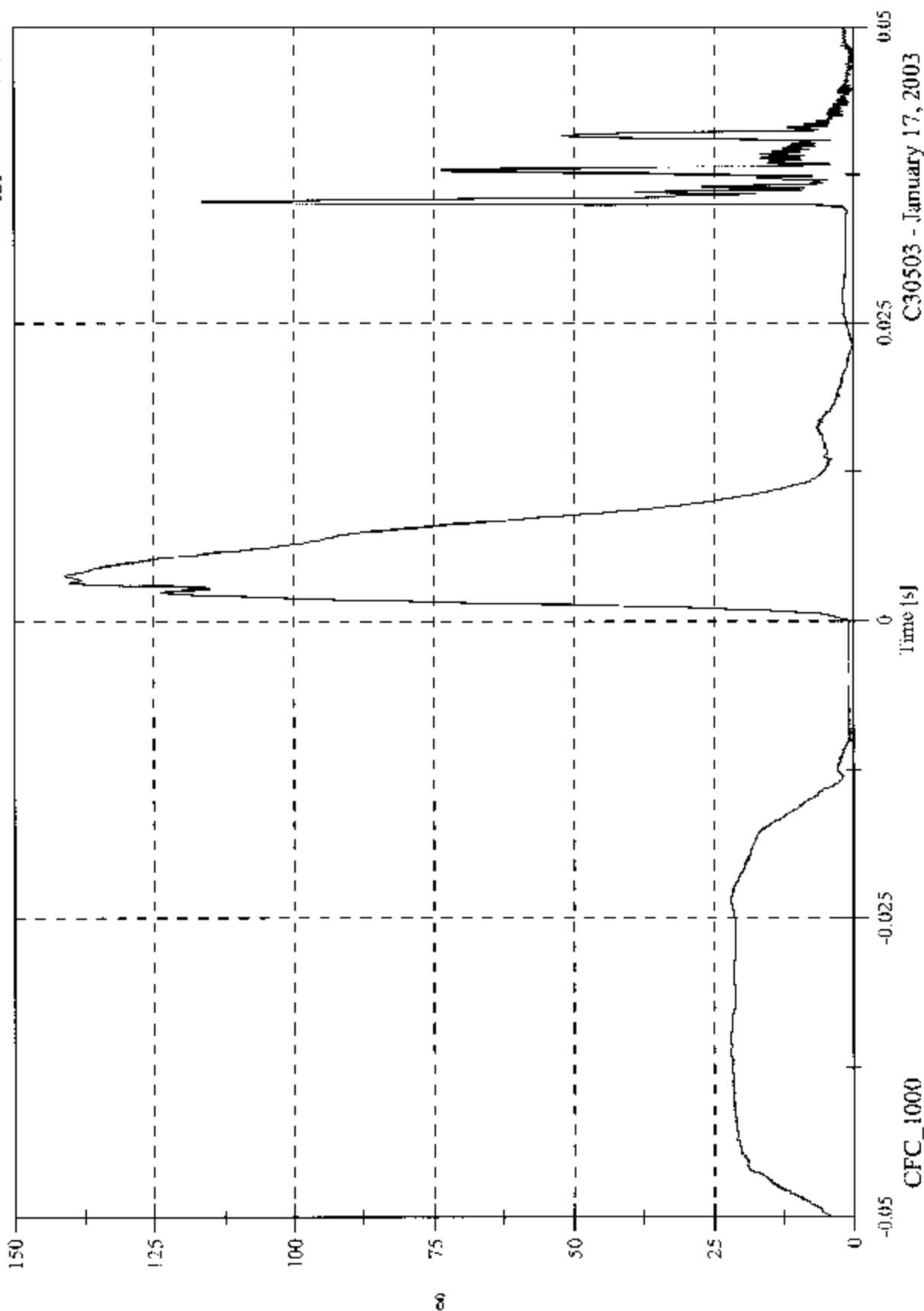
C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

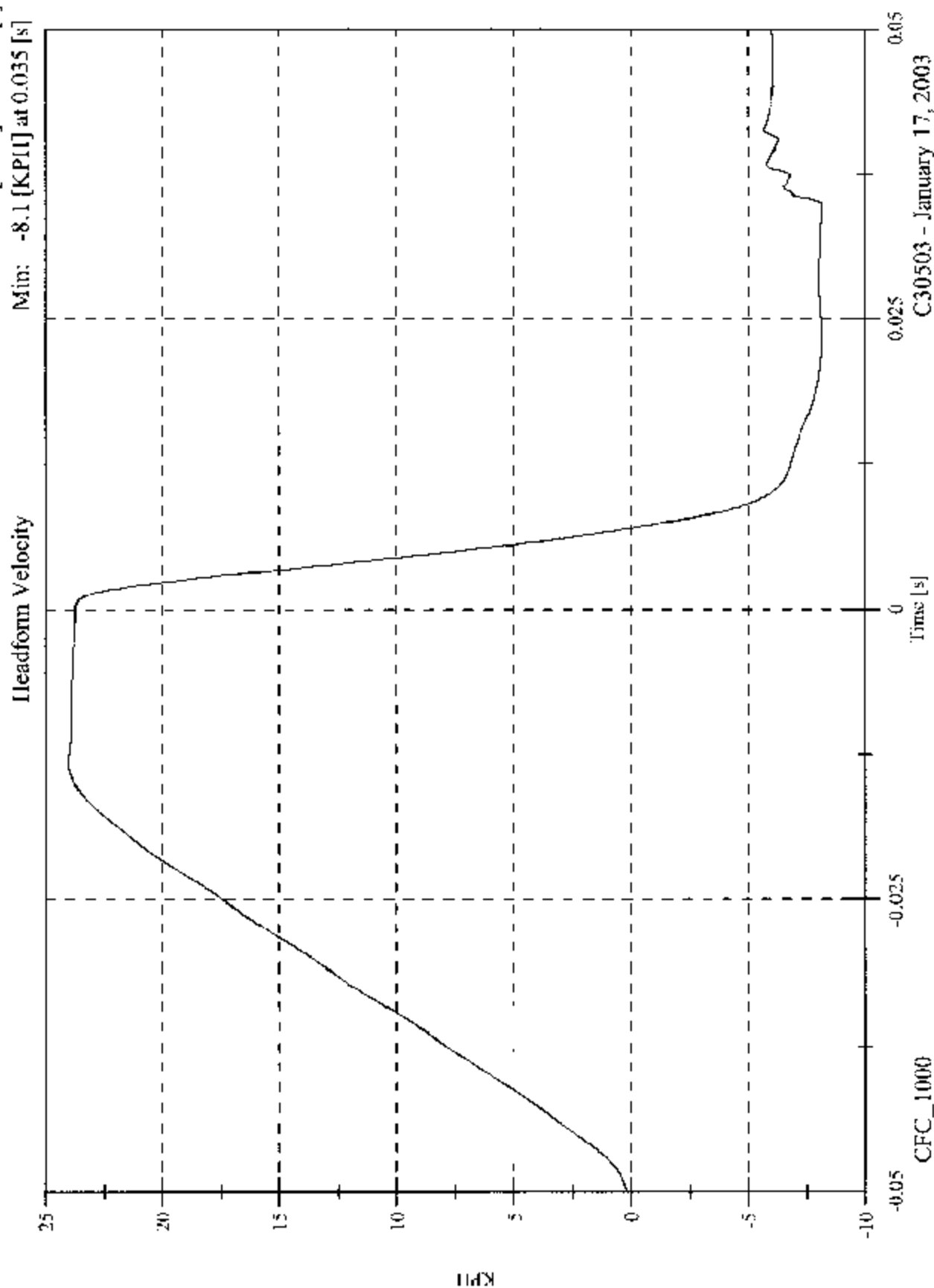
Headform Resultant

Max: 141.1 [g] at 0.004 [s]

Min: 0.1 [g] at 0.023 [s]



# FMVSS 2010 IMPACT TEST - 2003 HYUNDAI ELANTRA

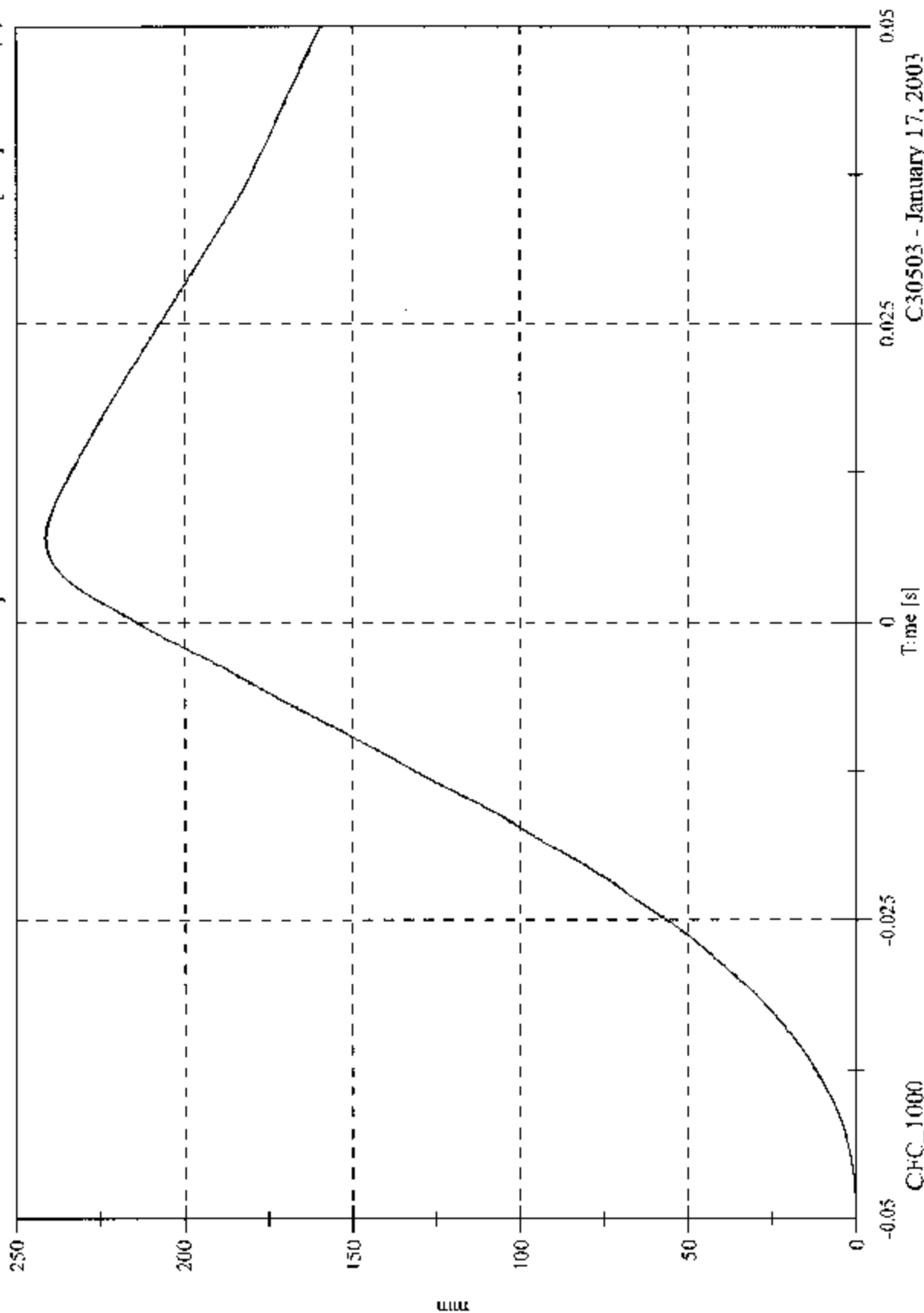


C30503 DRIVER SIDE SR3B IMPACT PLOT #5

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Displacement

Max: 241.3 [mm] at 0.007 [s]  
Min: 0.1 [mm] at -0.050 [s]



C30503 - January 17, 2003

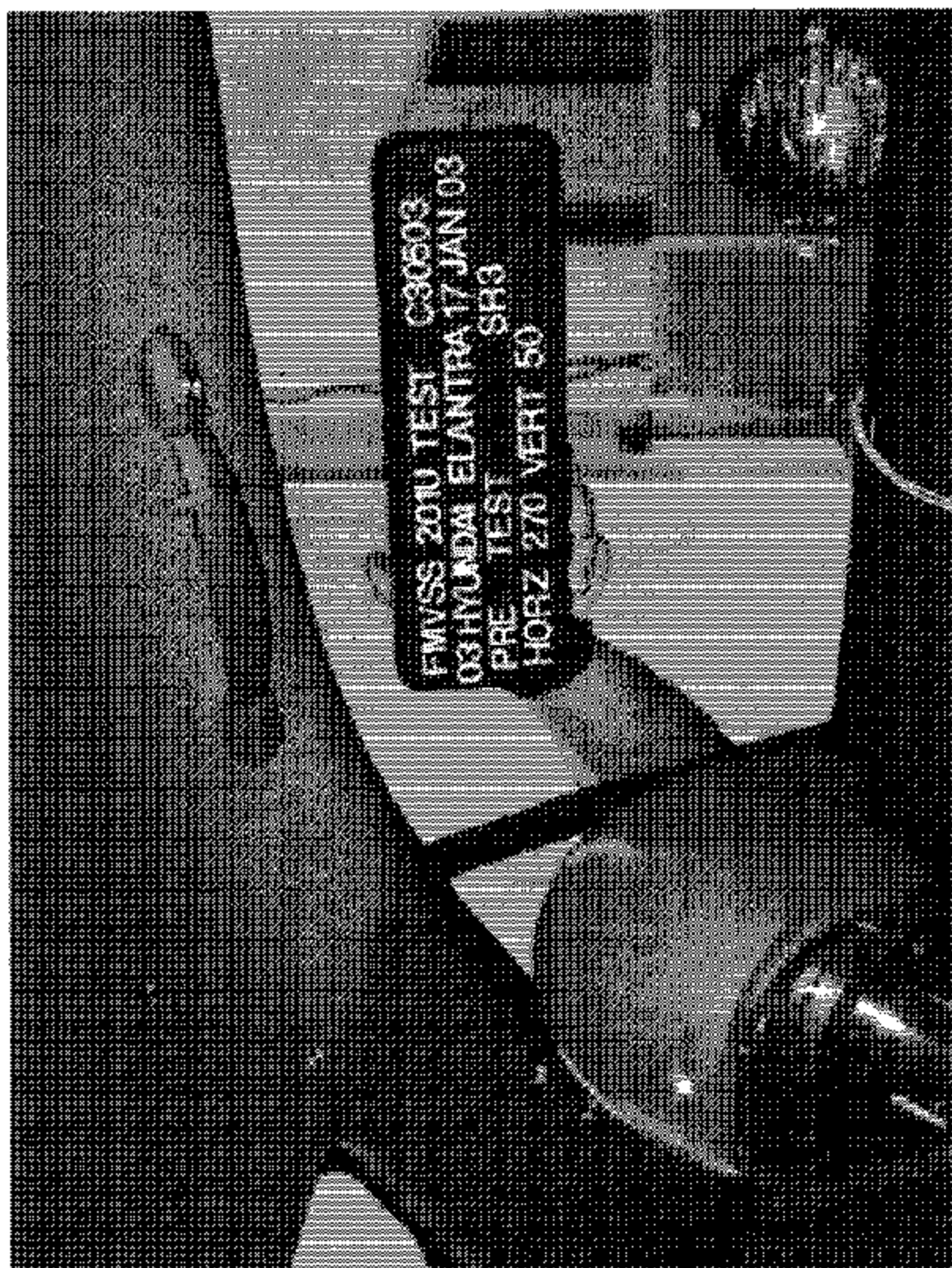


Figure : PRE-TEST SR3H

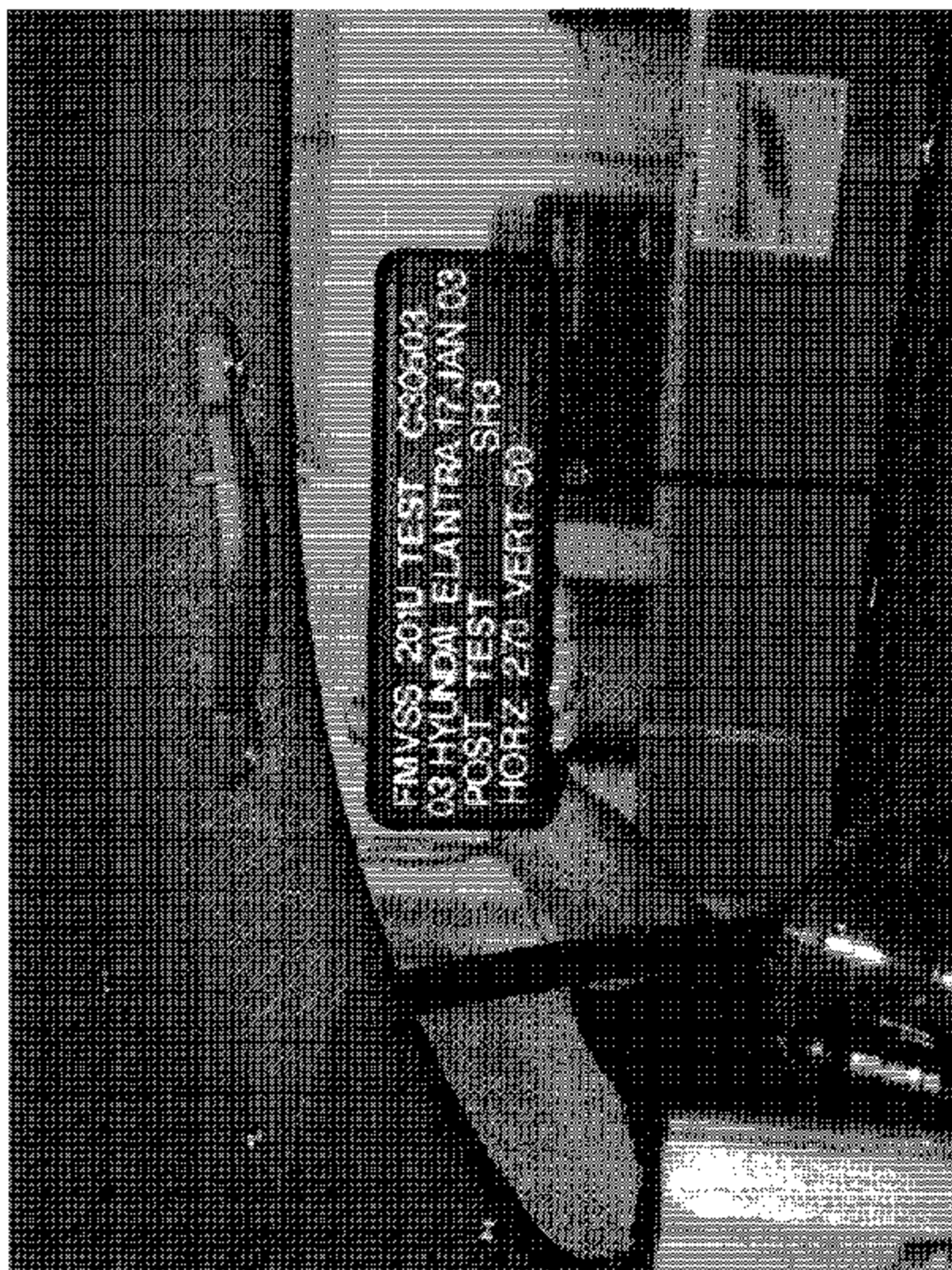


Figure 1: POST-TEST SR3B



FMVSS 2010 TEST C30503  
03 HYUNDAI ELANTRA 17 JAN 03  
POST TEST SR3  
HORZ 270 VERT 50

Figure : SR3 HEADFORM

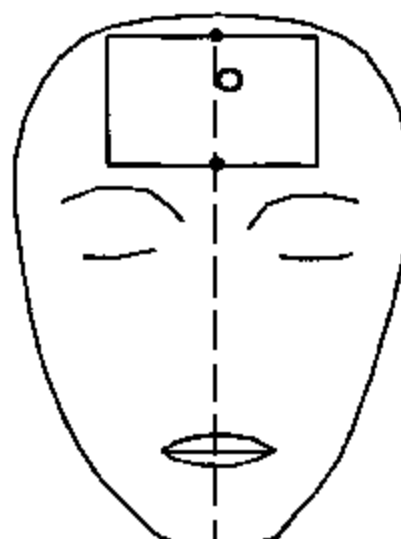
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHDN45D73L 509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 8 Test Date: January 17, 2003  
 Target Location: Upper Roof-Rear Pillar Area Target Code: URRP  
 Horizontal Impact Angle: 296 ° Vertical Impact Angle: 45 °  
 Ambient Temperature: 21 °C Time of Impact: 10:10  
 Headform Number: 0062

### Impact Point:

Description:

|                                  |    |       |          |           |
|----------------------------------|----|-------|----------|-----------|
| Description: From lower midpoint |    |       |          |           |
| On centerline                    | 46 | mm up |          |           |
| On centerline                    | 5  | -     | mm right | x mm left |



Free Motion HIC: 885.8 HIC(d): 834.7  
 Impact Velocity (kph): 23.39 HIC1: 5.8 msec HIC2: 10.9 msec

Post-Test Comments:



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - URRP

FMH Headform 0062

Location: URRP

Test Date: January 17, 2003

Work File: URRP

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 834.7

Lab Humidity: 12 %

HIC (36ms): 885.8

Velocity at Impact: 23.39 KPH

t1: 5.8 msec

t2: 10.9 msec

Free Flight Distance: 213.47 mm

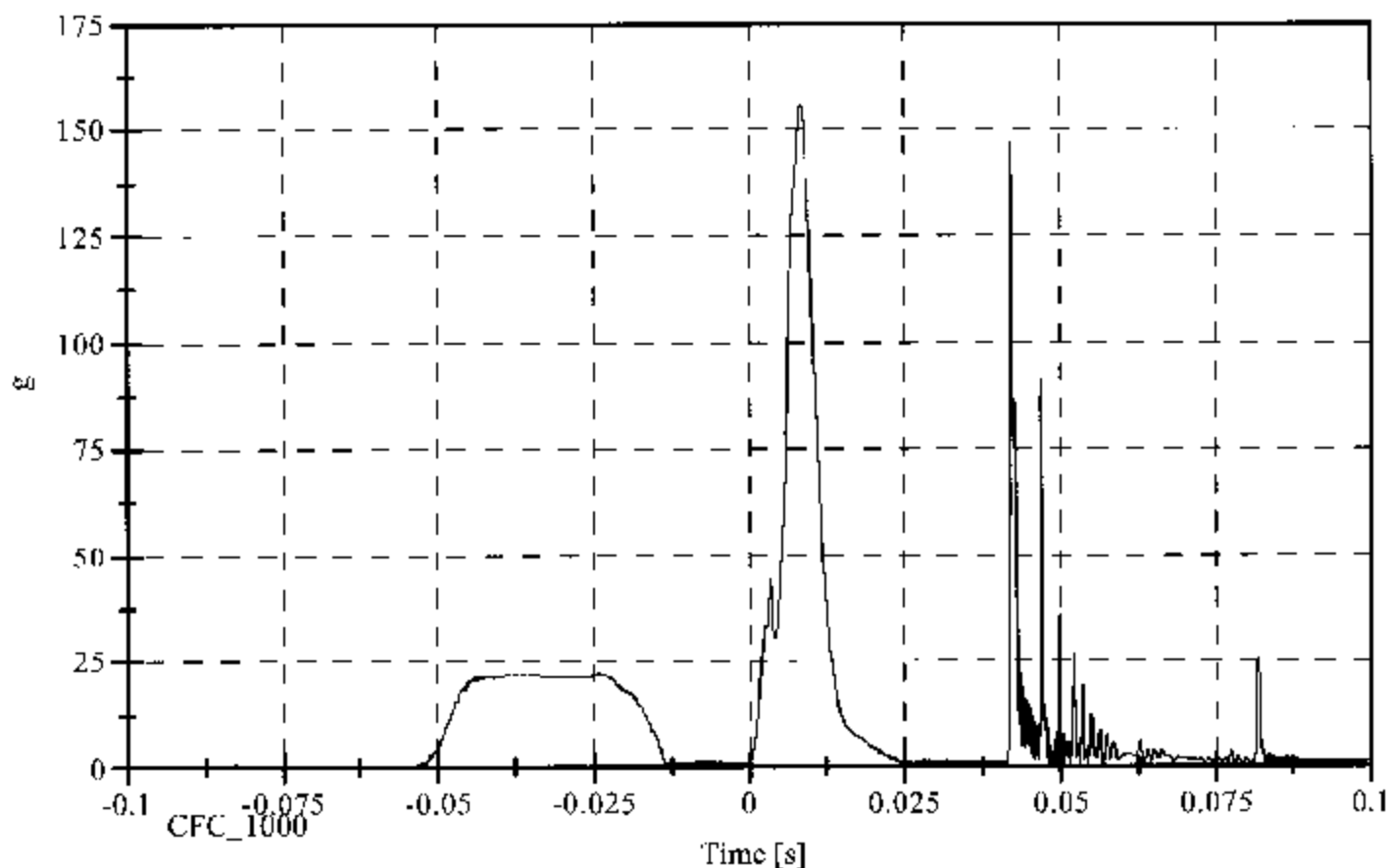
Duration: 5.1 msec

Average Acceleration: 10.2 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 156.2 [g] at 0.008 [s]

Min: 0.0 [g] at -0.096 [s]

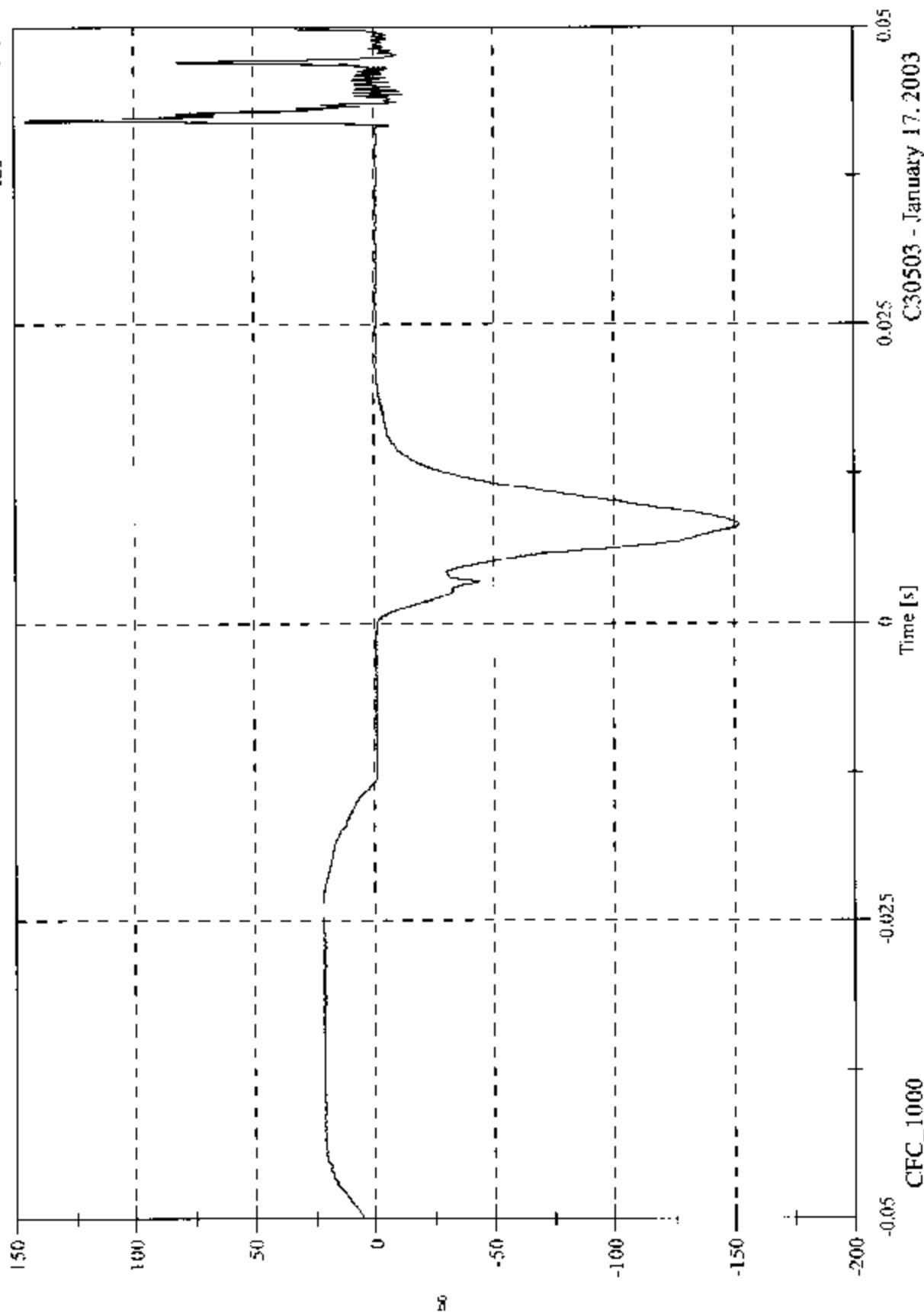


FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 145.3 [g] at 0.042 [s]

Min: -151.8 [g] at 0.008 [s]



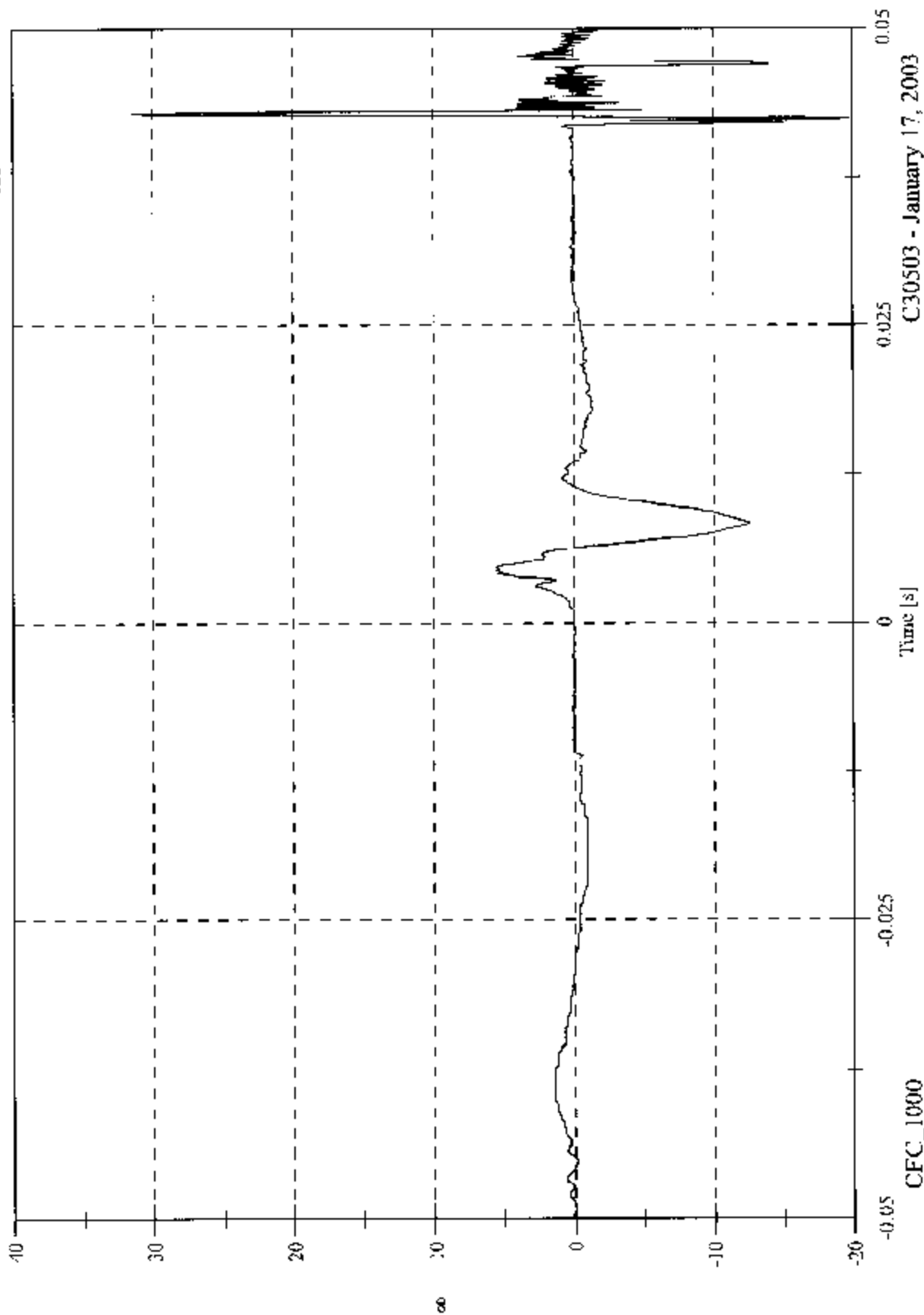
C30503 - January 17, 2003

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Y Acceleration

Max: 31.4 [g] at 0.043 [s]

Min: -19.8 [g] at 0.042 [s]

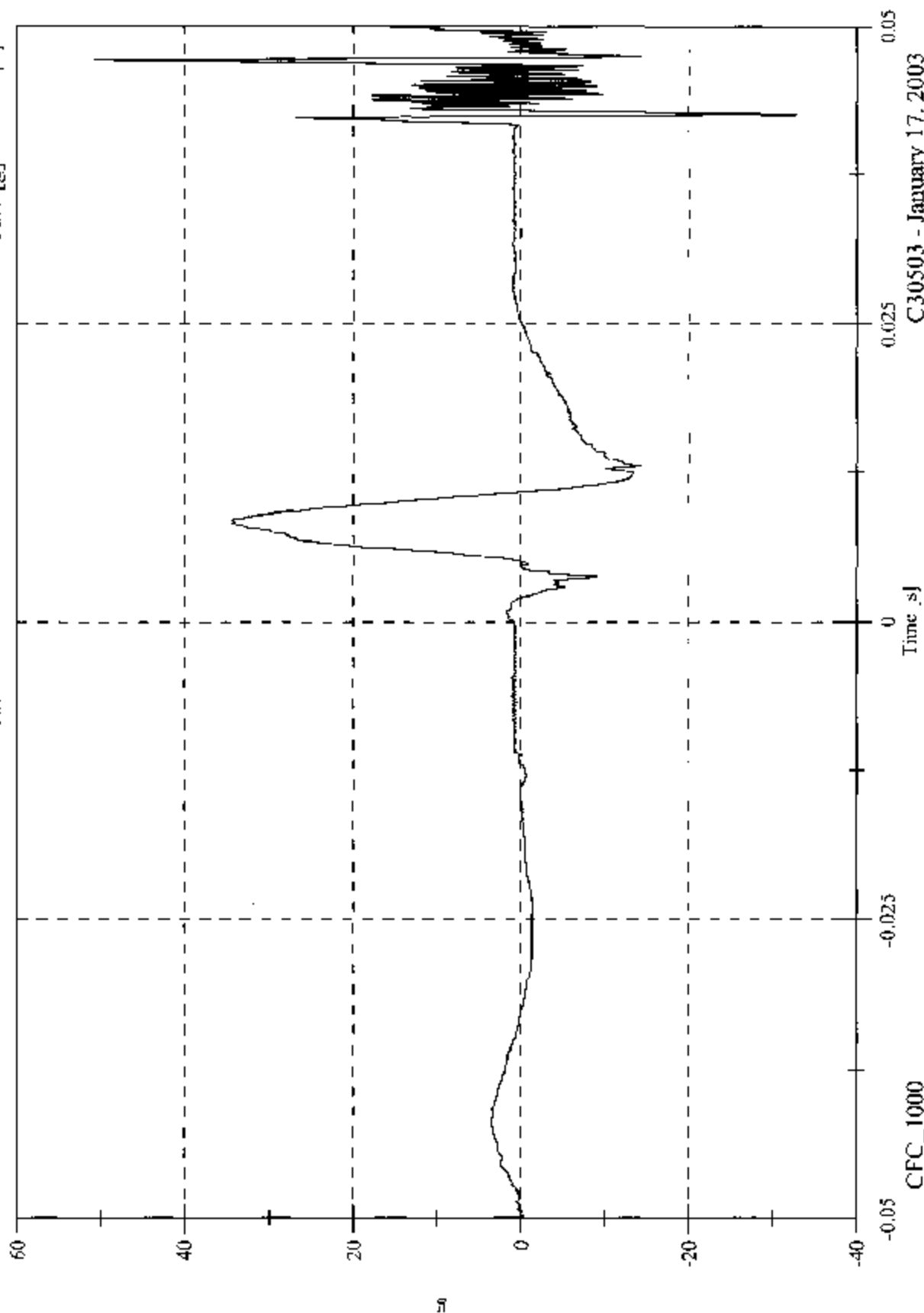


C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

Max: 50.7 [g] at 0.047 [s]  
Min: -32.7 [g] at 0.043 [s]

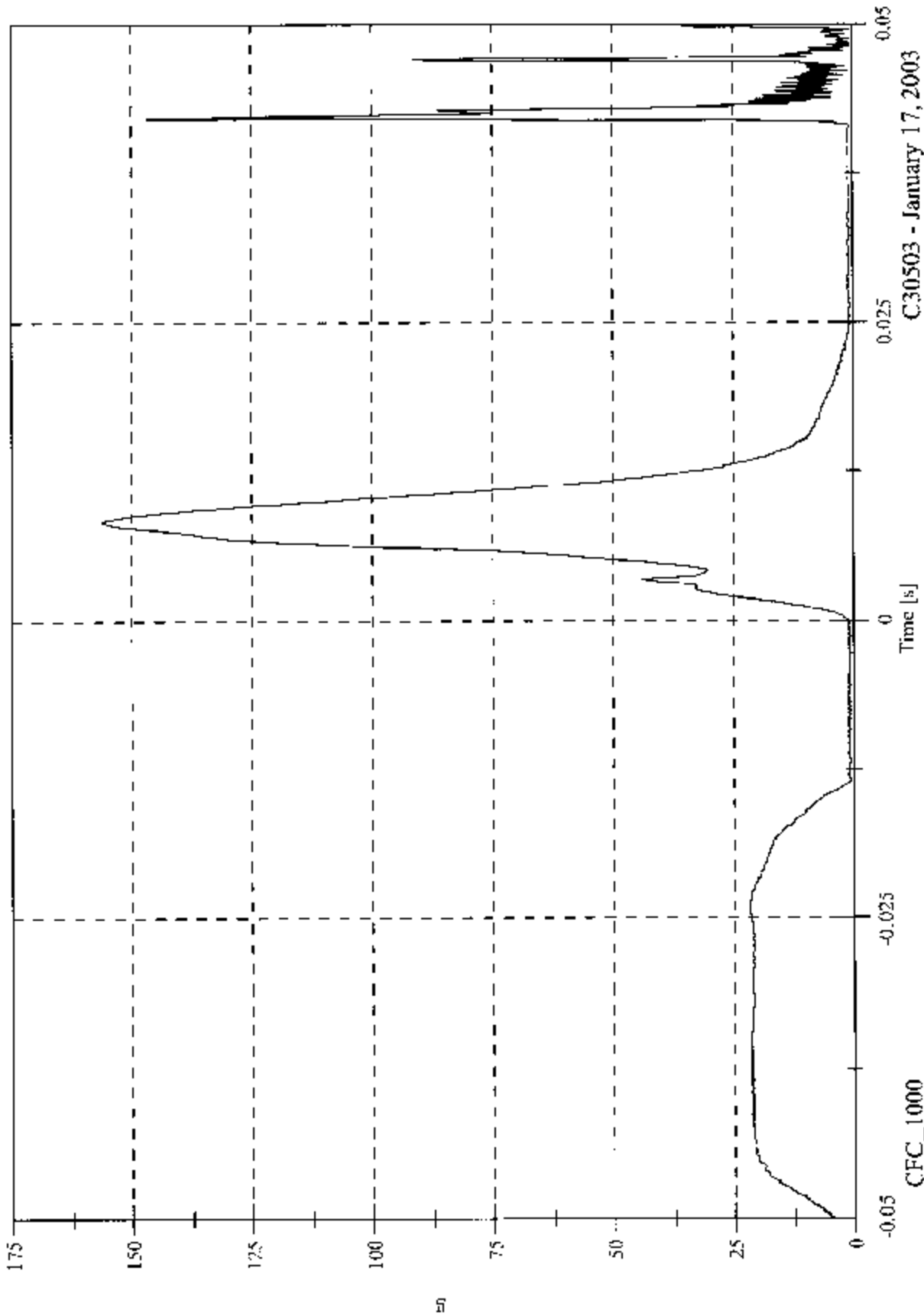


C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Resultant

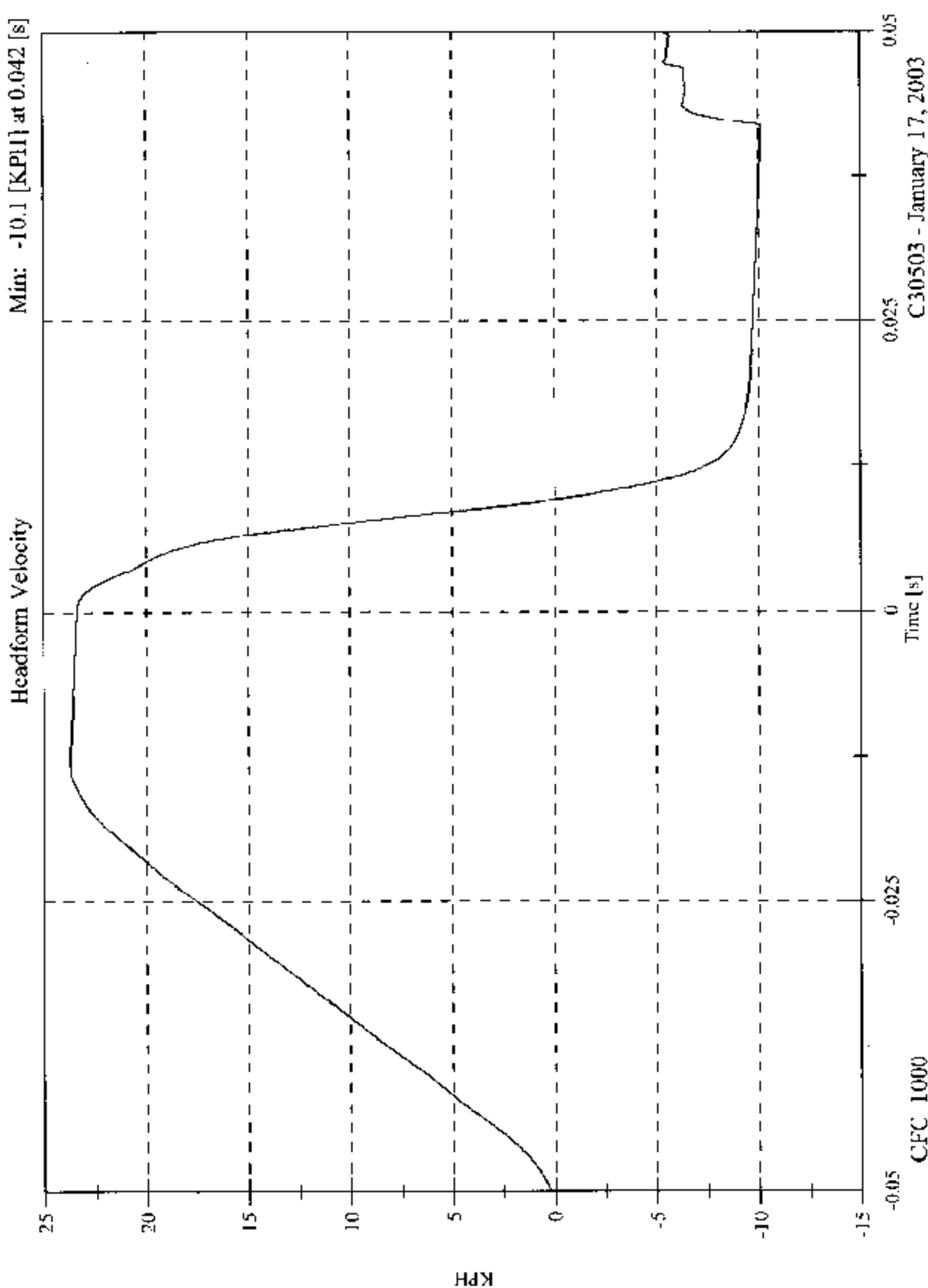
Max: 156.2 [g] at 0.008 [s]  
Min: 0.7 [g] at 0.026 [s]



C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 23.7 [KPH] at -0.013 [s]  
 Min: -10.1 [KPH] at 0.042 [s]



CFC\_1000

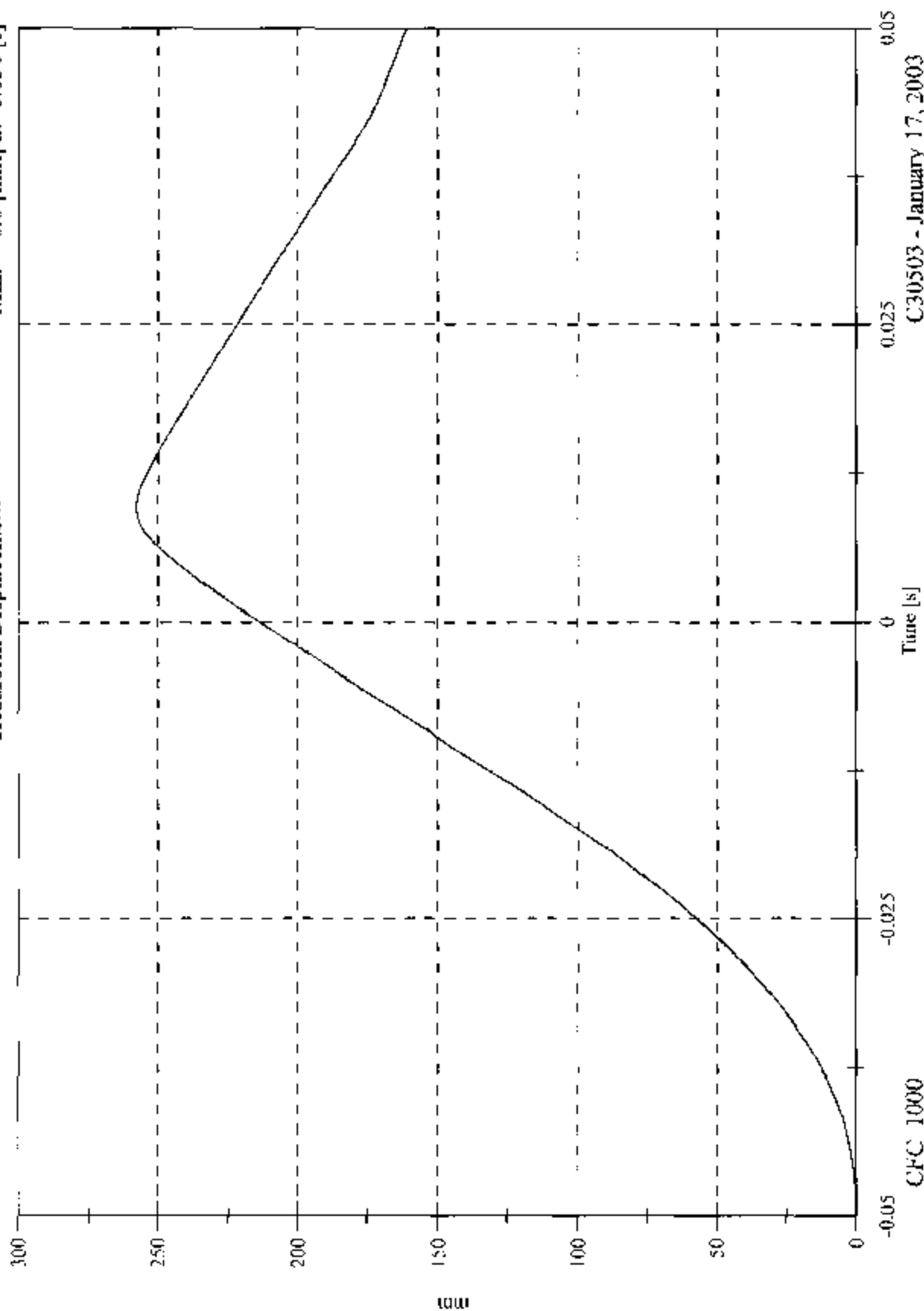
Time [s]

C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Displacement

Max: 257.7 [mm] at 0.010 [s]  
Min: 0.0 [mm] at -0.050 [s]



C30503 - January 17, 2003

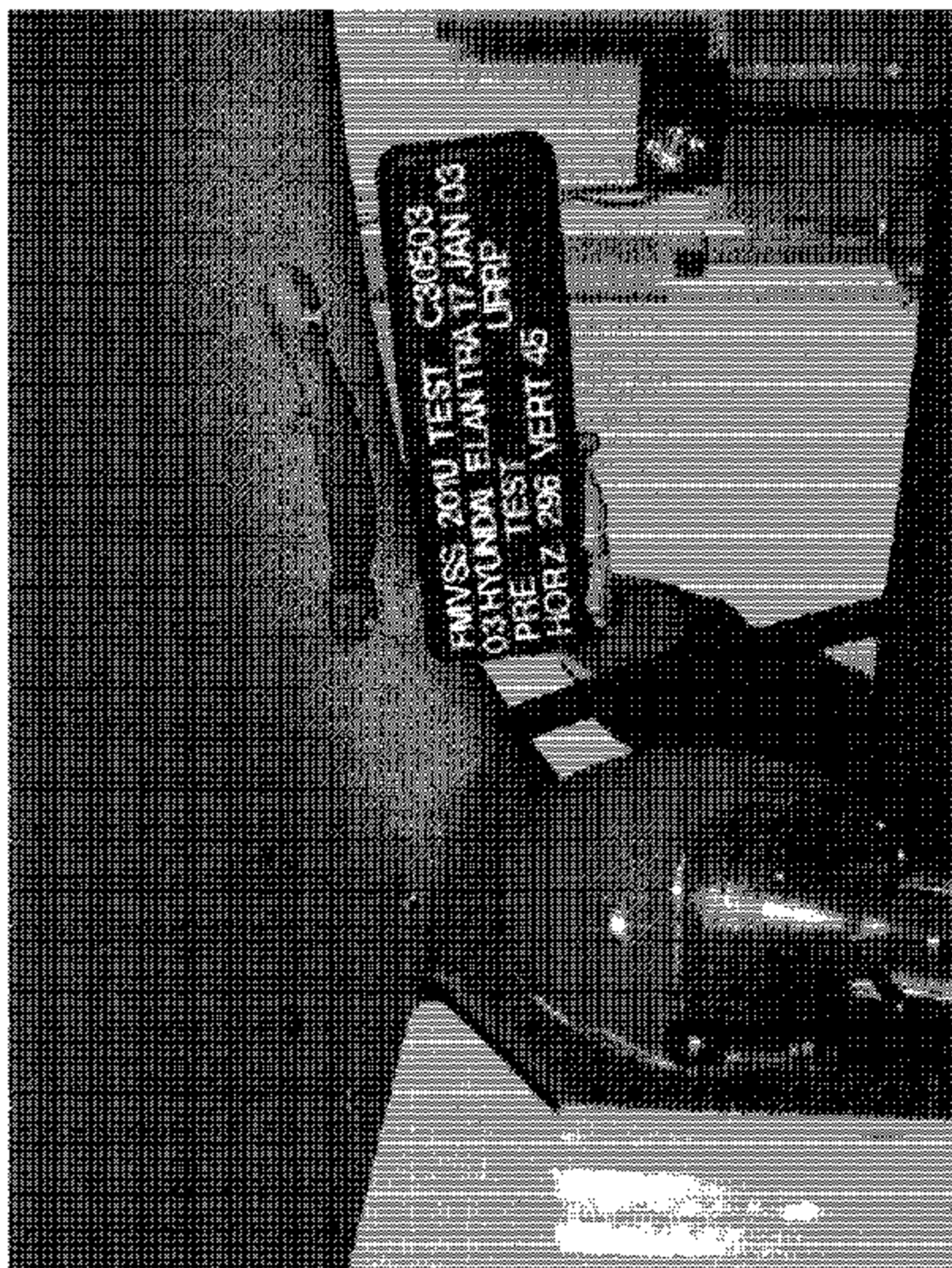


Figure : PRE-TEST GRRP



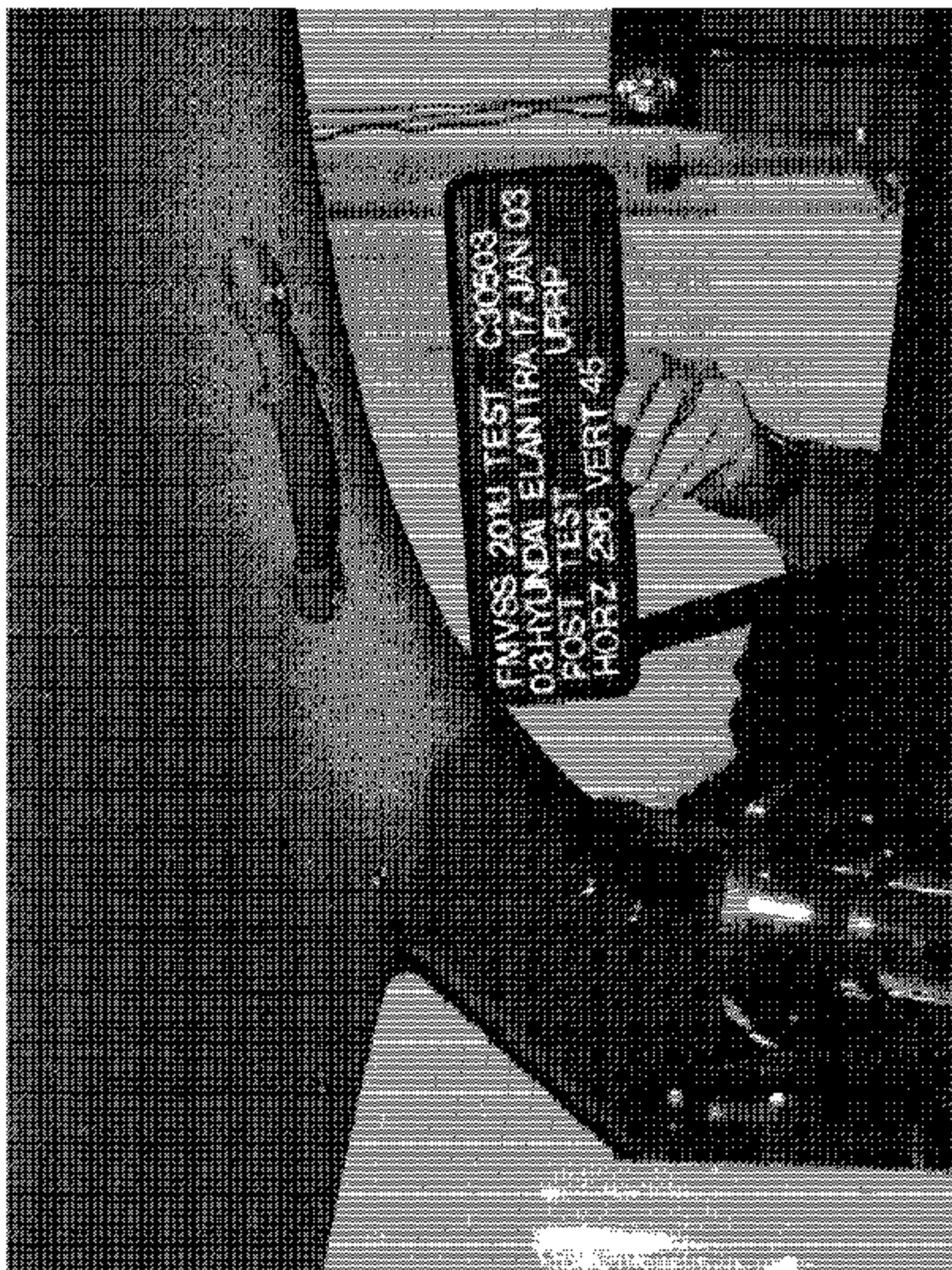


Figure : POST-TEST URRP

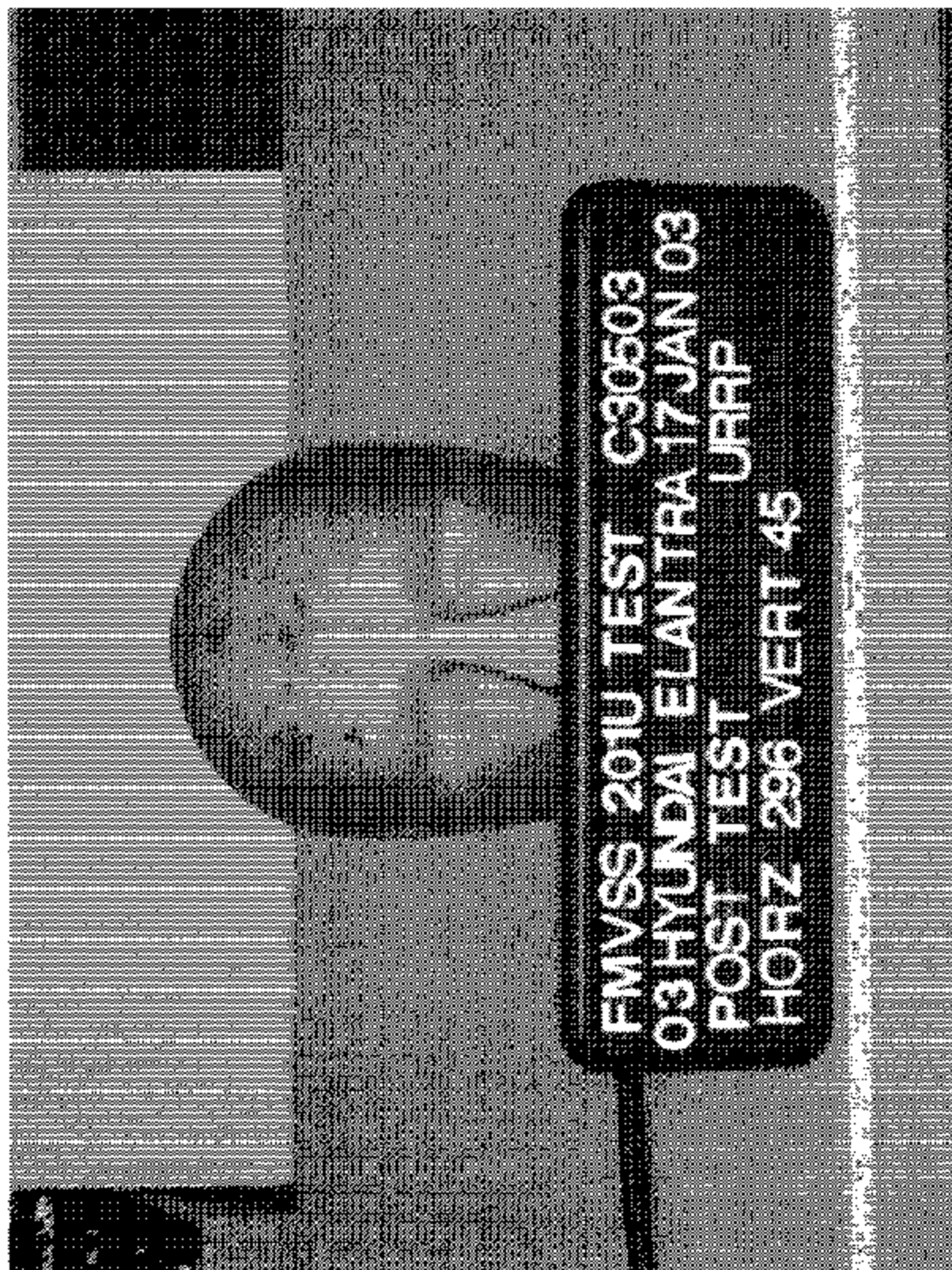


Figure : UNKP HEADFORM

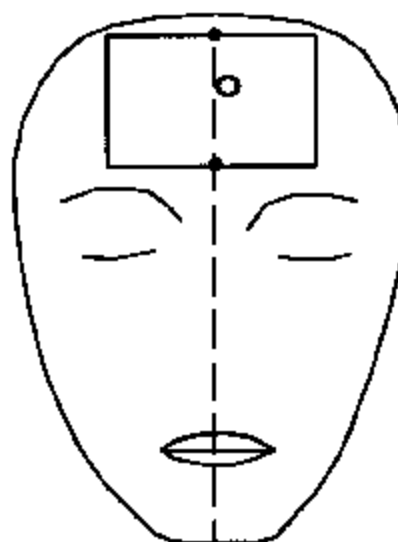
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMH1DN45D73U 509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 9 Test Date: January 17, 2003  
 Target Location: B-pillar Target Code: BP1  
 Horizontal Impact Angle: 270 ° Vertical Impact Angle: 16 °  
 Ambient Temperature: 21 °C Time of Impact: 11:00  
 Headform Number: 0355

### Impact Point:

Description:

|                                  |    |       |          |           |
|----------------------------------|----|-------|----------|-----------|
| Description: From lower midpoint |    |       |          |           |
| On centerline                    | 49 | mm up |          |           |
| On centerline                    | 7  | -     | mm right | x mm left |



Free Motion HIC: 817.7 HIC(d): 783.3  
 Impact Velocity (kph): 23.77 HIC1: 3.5 msec HIC2: 10.5 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - BP1

FMII Headform 0355

Location: BP1

Test Date: January 17, 2003

Work File: BP1

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 783.3

Lab Humidity: 12 %

HIC (36ms): 817.7

Velocity at Impact: 23.77 KPH

t1: 3.5 msec

t2: 10.5 msec

Free Flight Distance: 217.92 mm

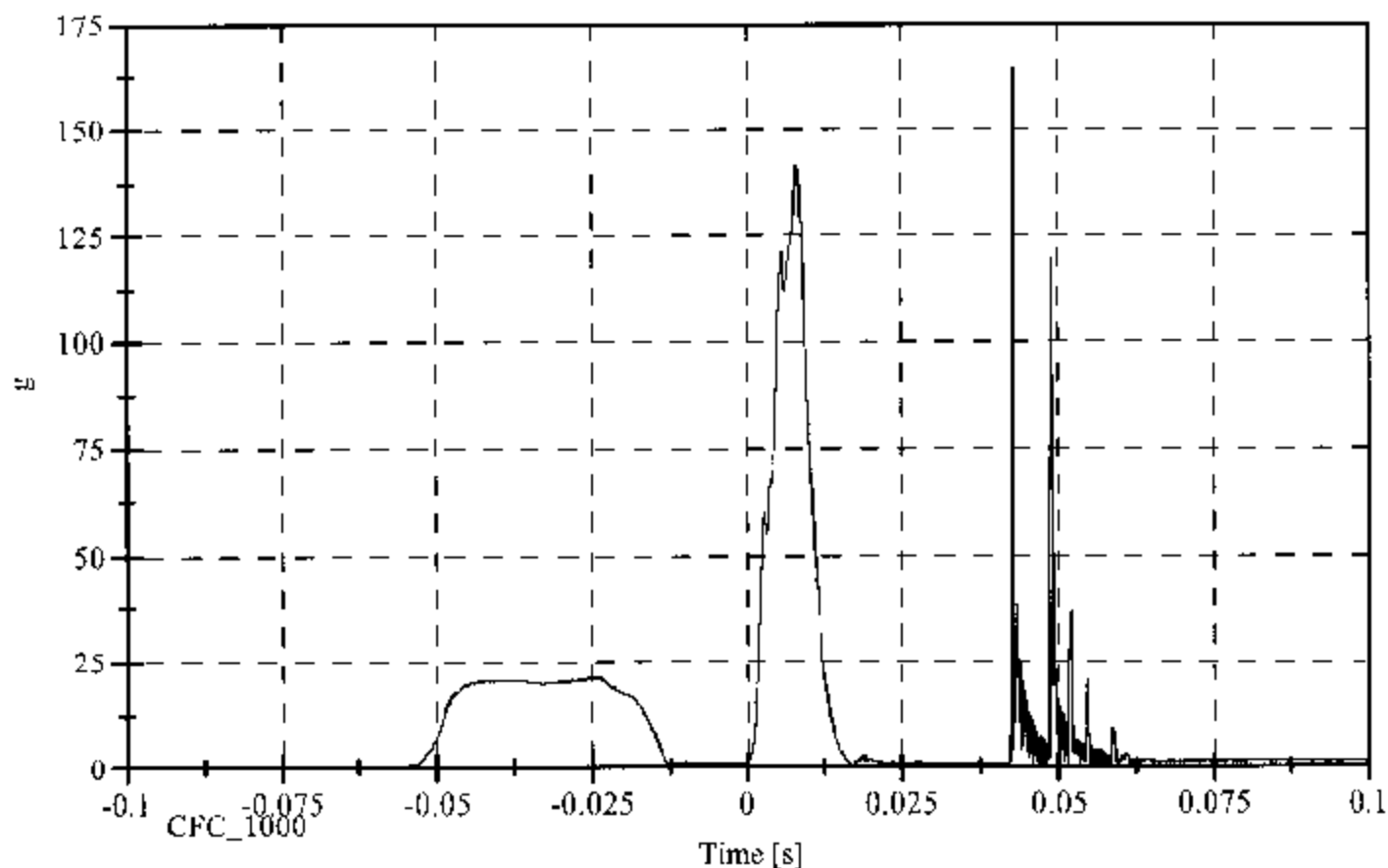
Duration: 7.0 msec

Average Acceleration: 9.9 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 164.3 [g] at 0.043 [s]

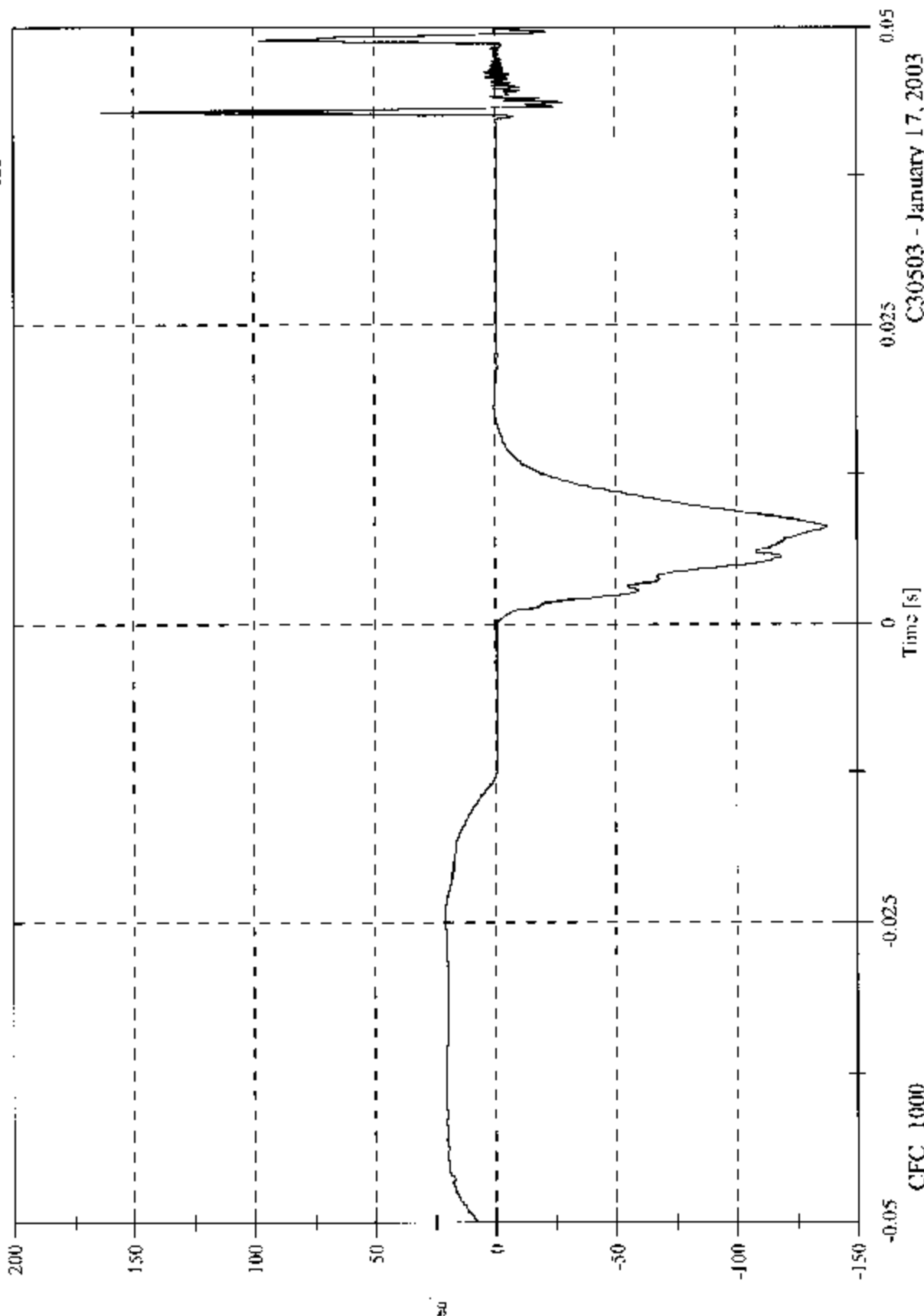
Min: 0.0 [g] at -0.093 [s]



FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 163.6 [g] at 0.043 [s]  
Min: -137.4 [g] at 0.008 [s]

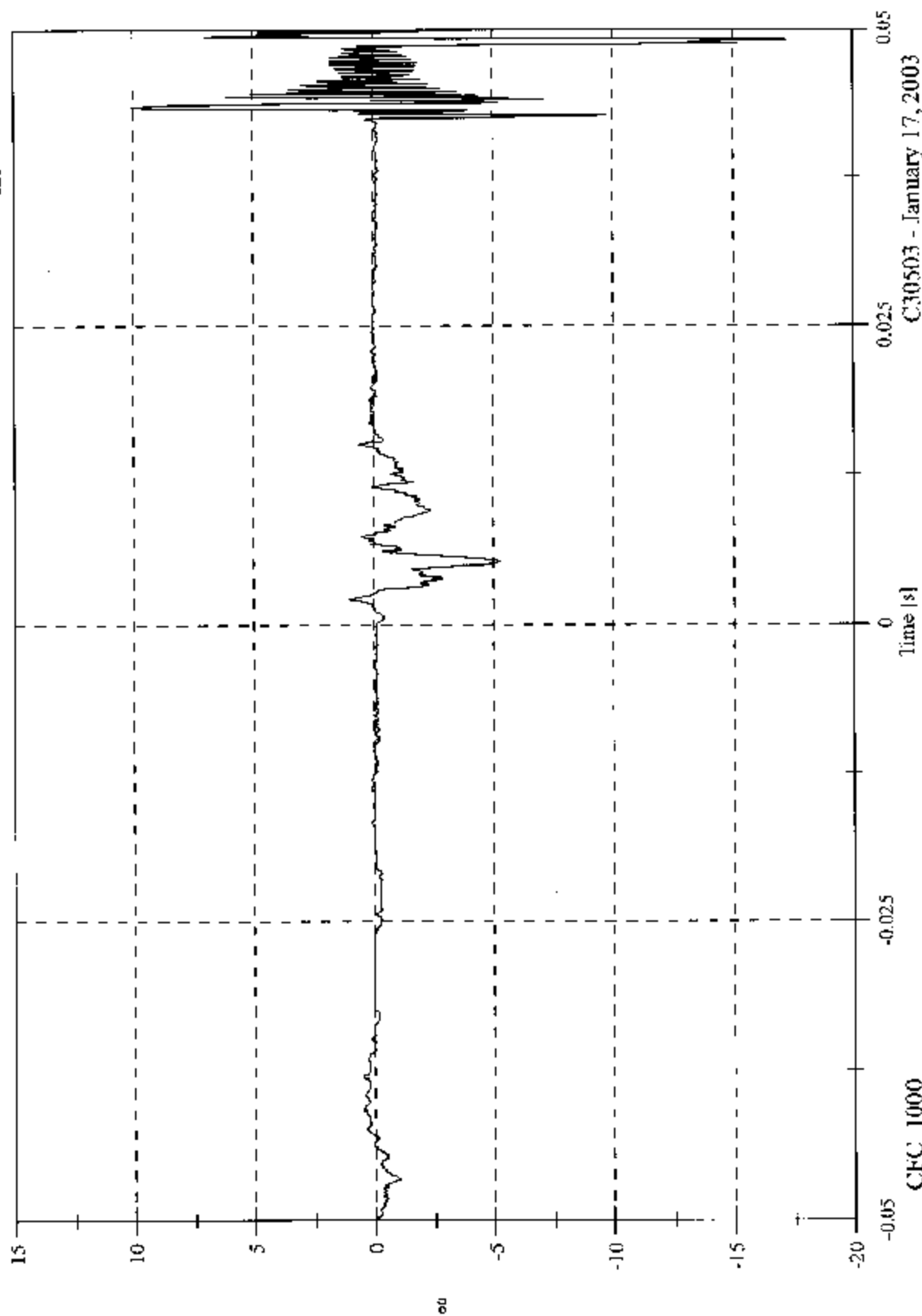


C30503 - January 17, 2003

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Y Acceleration

Max: 10.1 [g] at 0.043 [s]  
Min: -17.2 [g] at 0.049 [s]



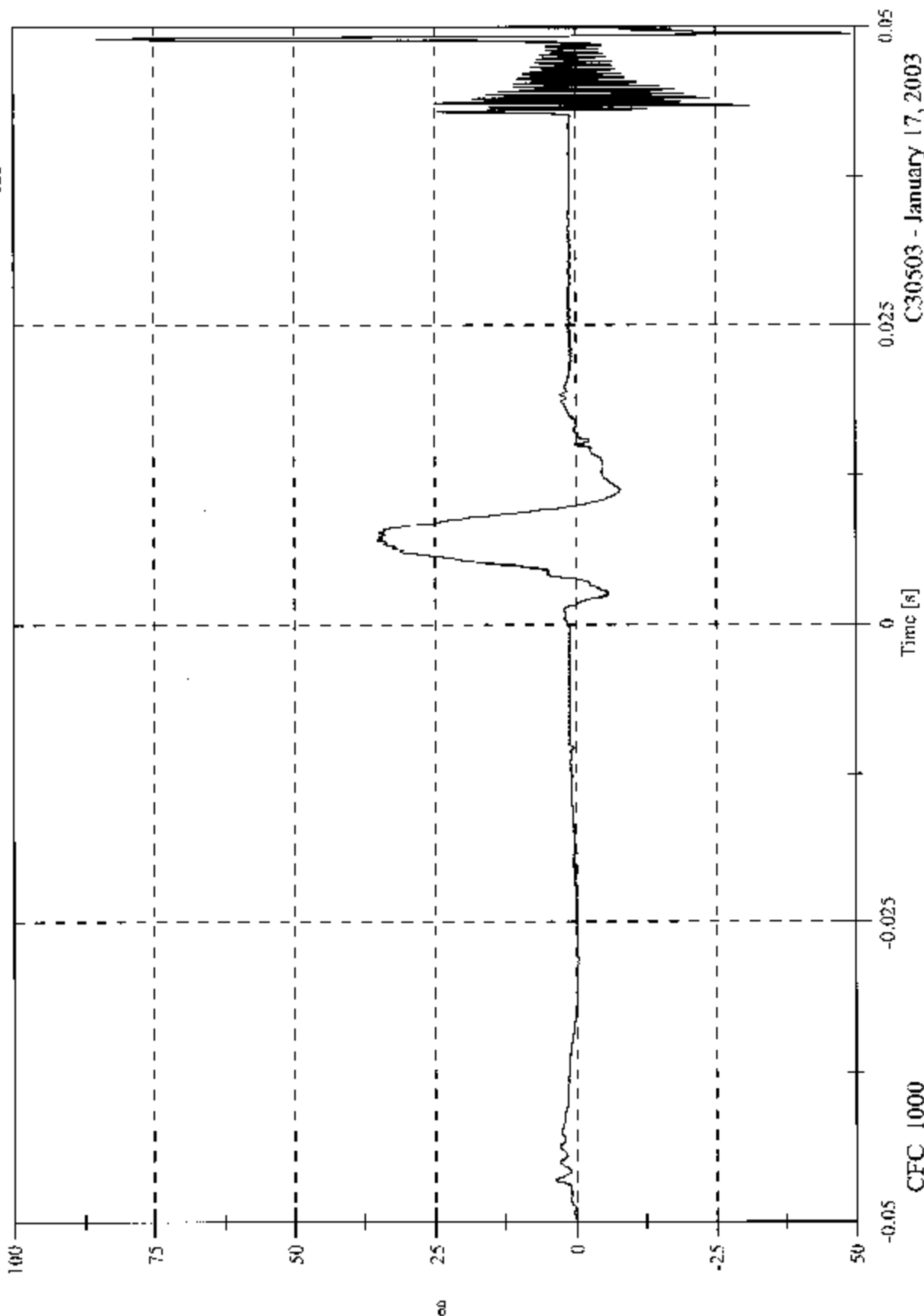
C30503 BP1 IMPACT PLOT #2

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

Max: 85.1 [g] at 0.049 [s]

Min: -49.1 [g] at 0.049 [s]

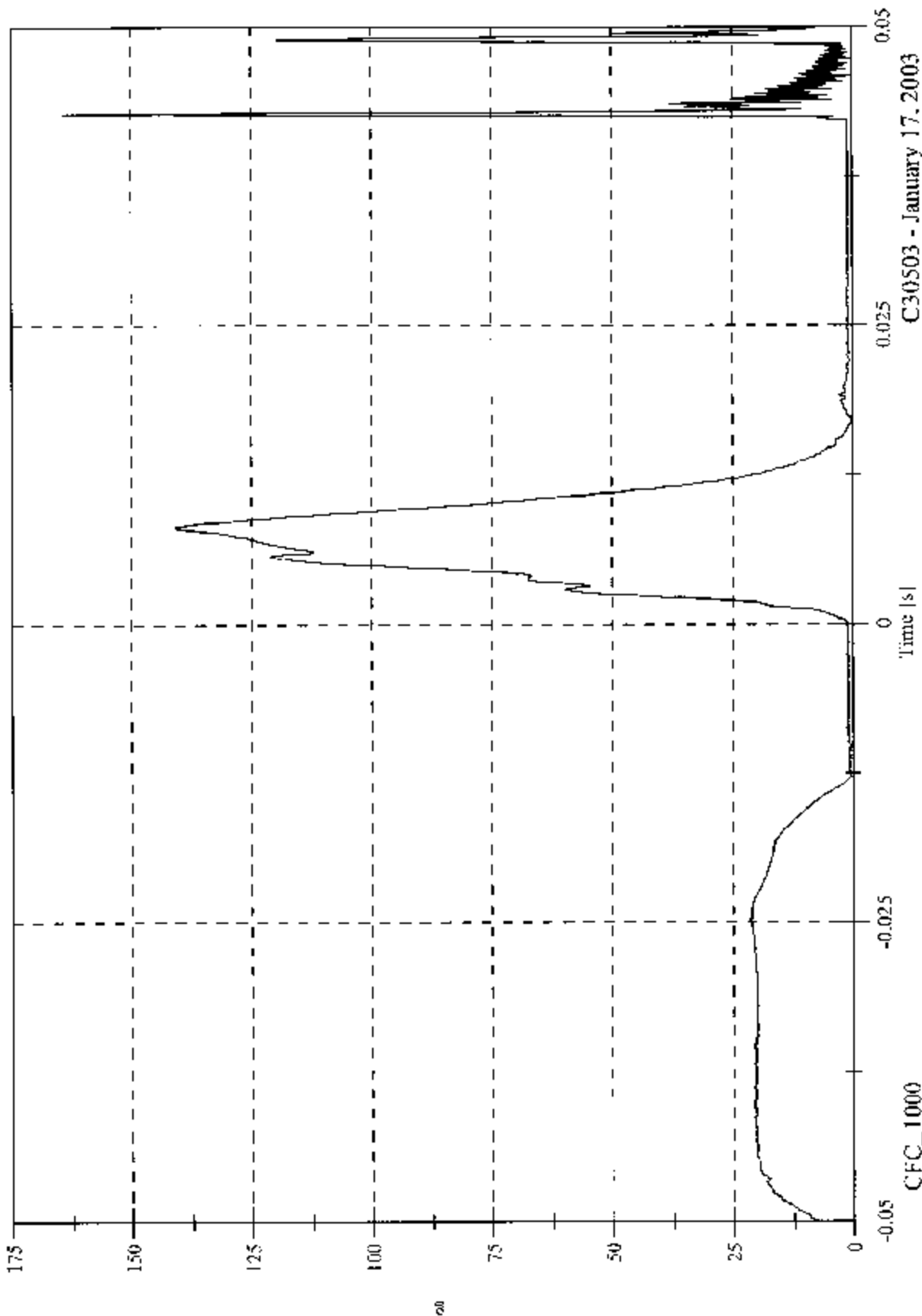


C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Resultant

Max: 164.3 [g] at 0.043 [s]  
Min: 0.3 [g] at 0.017 [s]



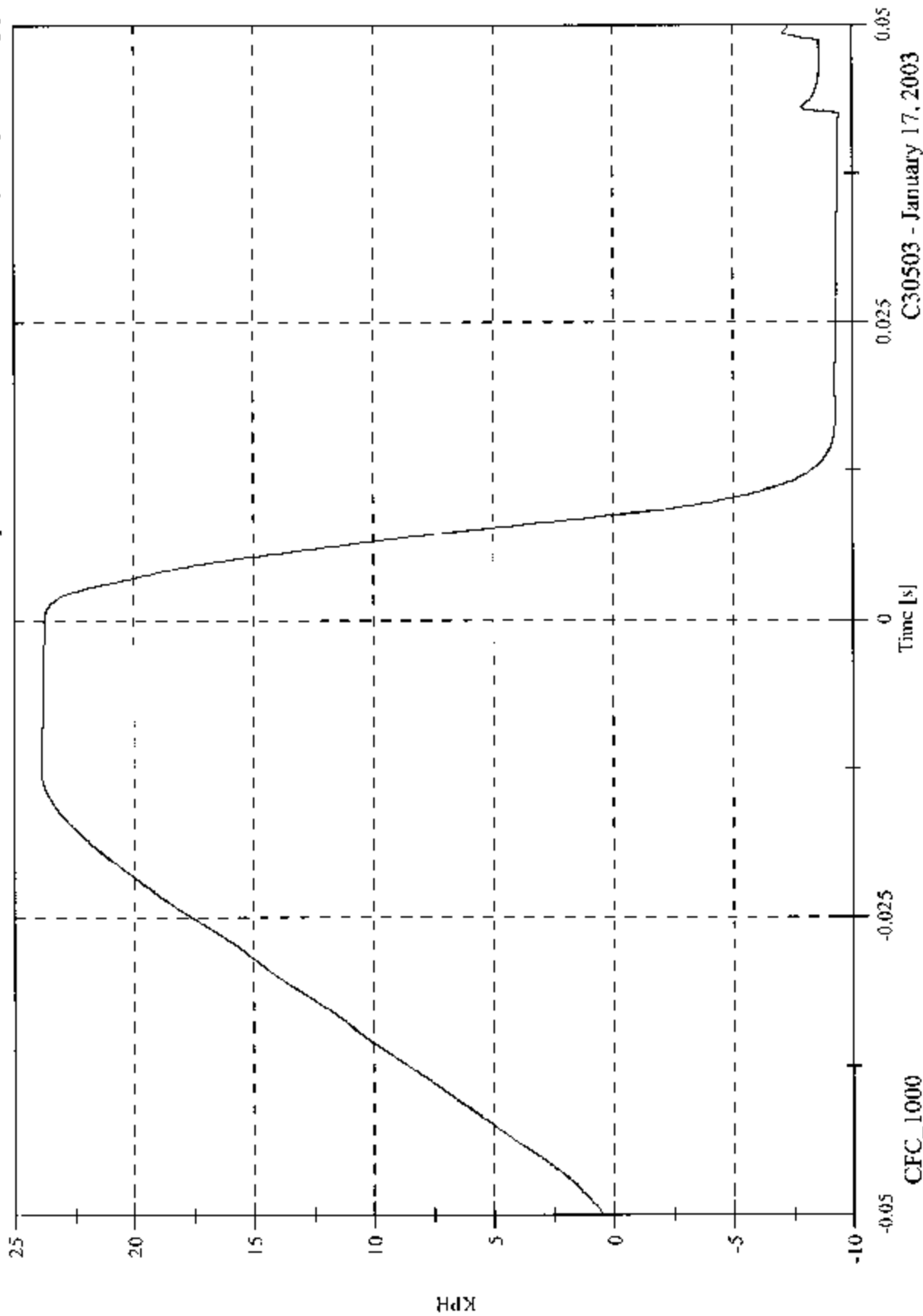
C30503 - January 17, 2003



FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Velocity

Max: 23.9 [KPH] at -0.013 [s]  
Min: -9.4 [KPH] at 0.042 [s]

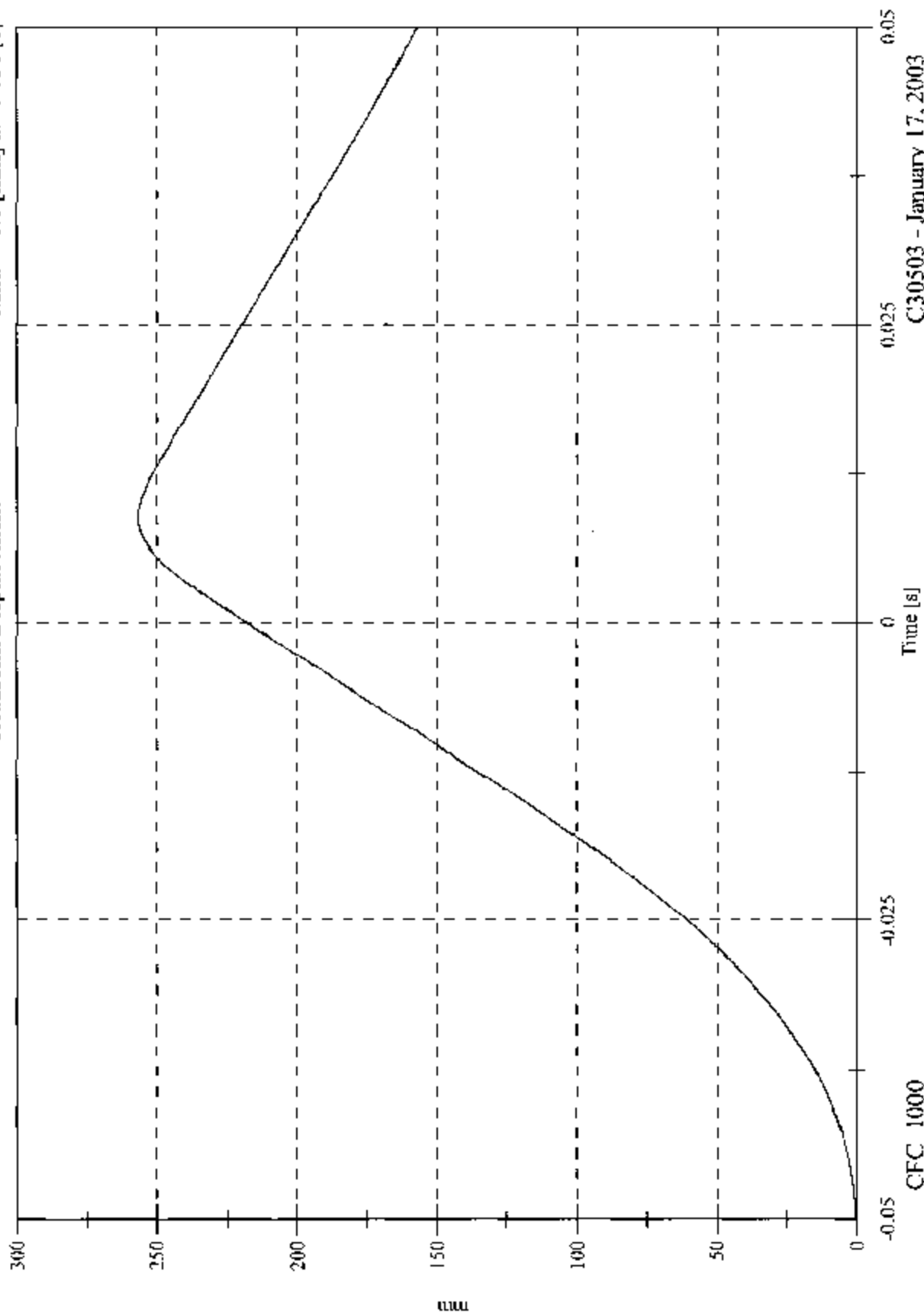


C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 256.8 [mm] at 0.009 [s]  
 Min: 0.6 [mm] at -0.050 [s]

Headform Displacement



C30503 - January 17, 2003

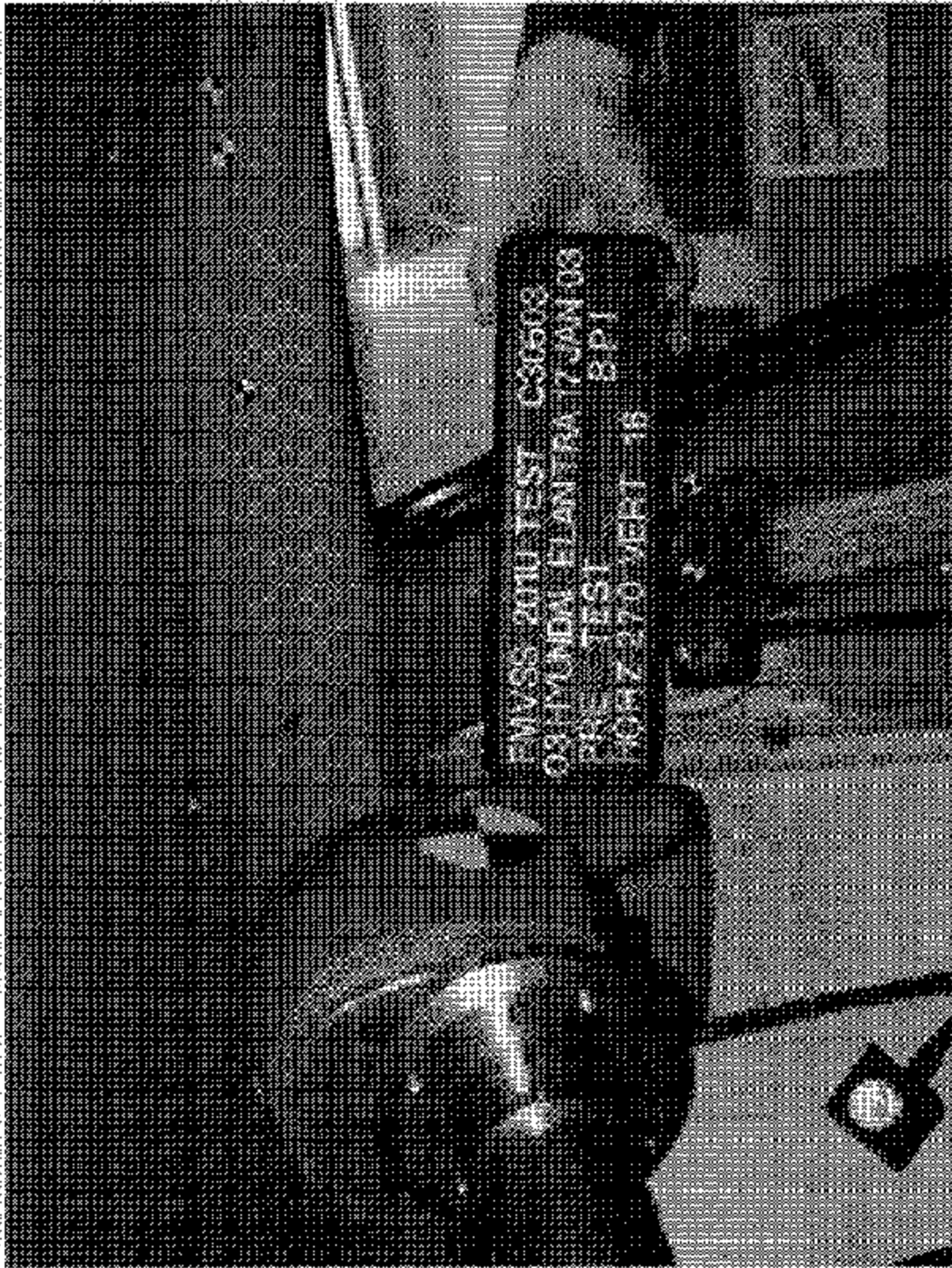


Figure : PRE-TEST BP1



Figure : POST-TEST BPI

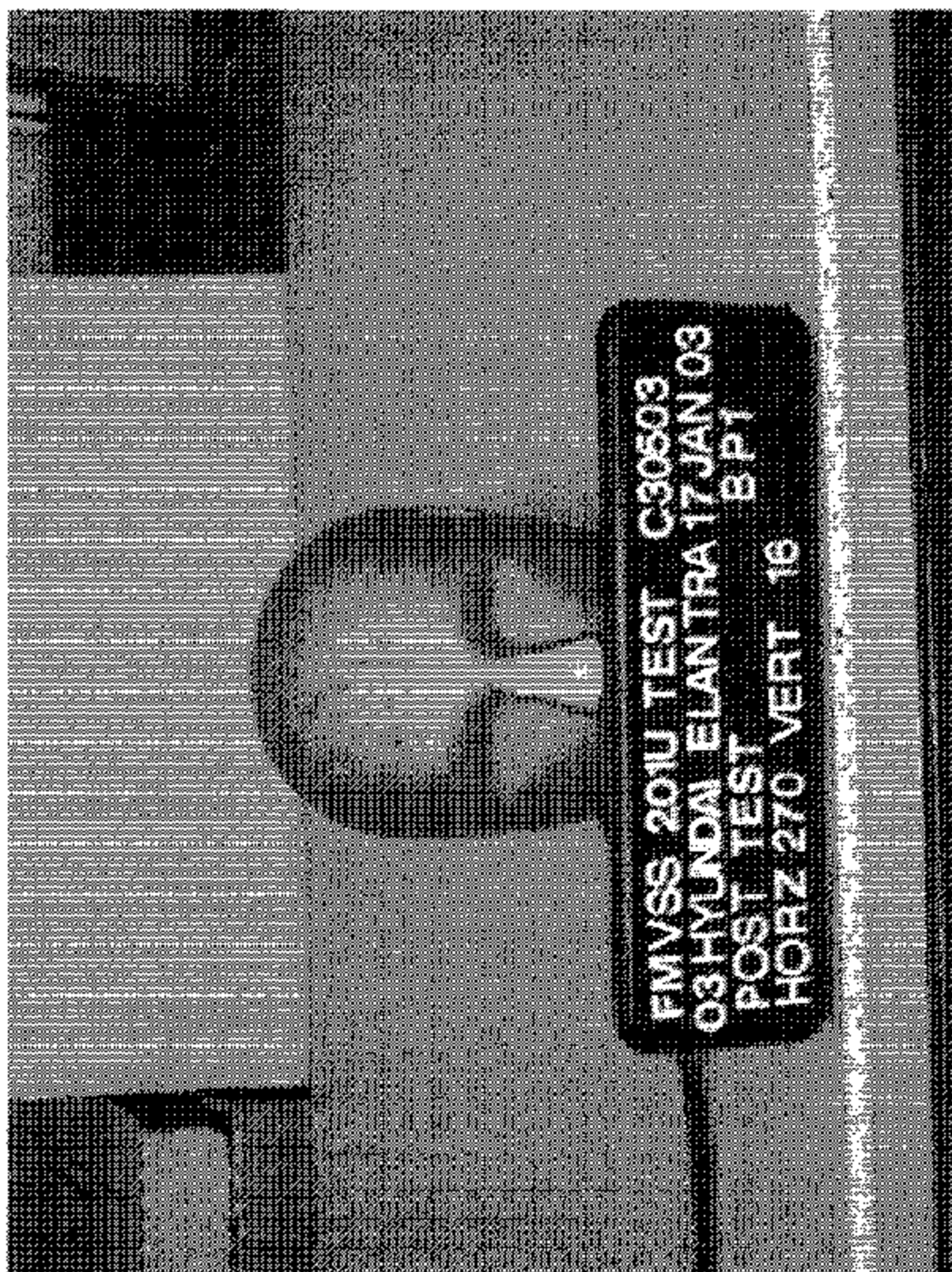


Figure BPI HEADFORM

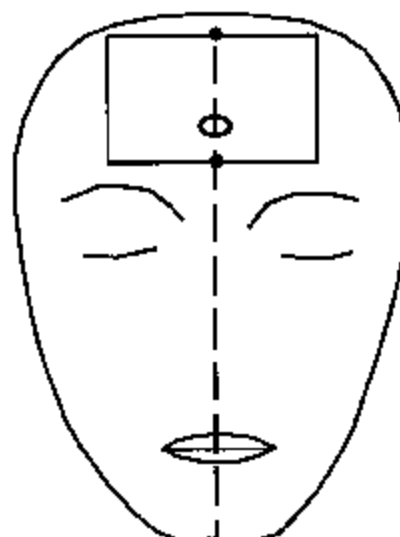
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHLDN45D73U509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 10 Test Date: January 17, 2003  
 Target Location: A-pillar Target Code: AP2  
 Horizontal Impact Angle: 232 ° Vertical Impact Angle: 48 °  
 Ambient Temperature: 21 °C Time of Impact: 12:00  
 Headform Number: 0642

# Impact Point:

Description:

|                                  |    |       |          |           |
|----------------------------------|----|-------|----------|-----------|
| Description: From lower midpoint |    |       |          |           |
| On centerline                    | 14 | mm up |          |           |
| On centerline                    | 0  | -     | mm right | - mm left |



Free Motion HIC: 777.9 HIC(d): 753.3  
 Impact Velocity (kph): 23.57 HIC1: 1.2 msec HIC2: 9.3 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - AP2

FMII Headform 0642

Location: AP2

Test Date: January 17, 2003

Work File: AP2

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 753.3

Lab Humidity: 12 %

HIC (36ms): 777.9

Velocity at Impact: 23.57 KPH

t1: 1.2 msec

t2: 9.3 msec

Free Flight Distance: 209.54 mm

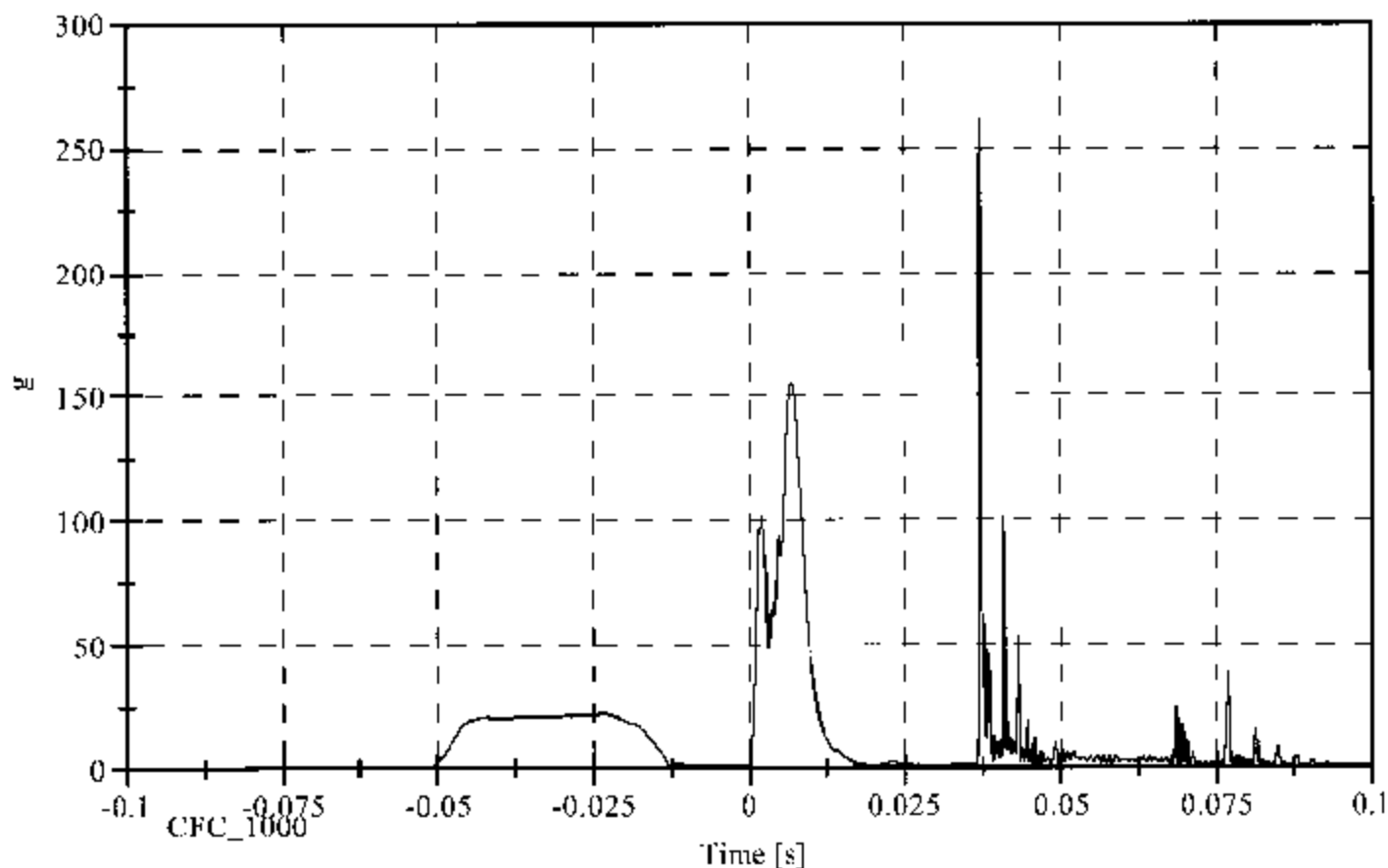
Duration: 8.1 msec

Average Acceleration: 10.4 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 260.6 [g] at 0.037 [s]

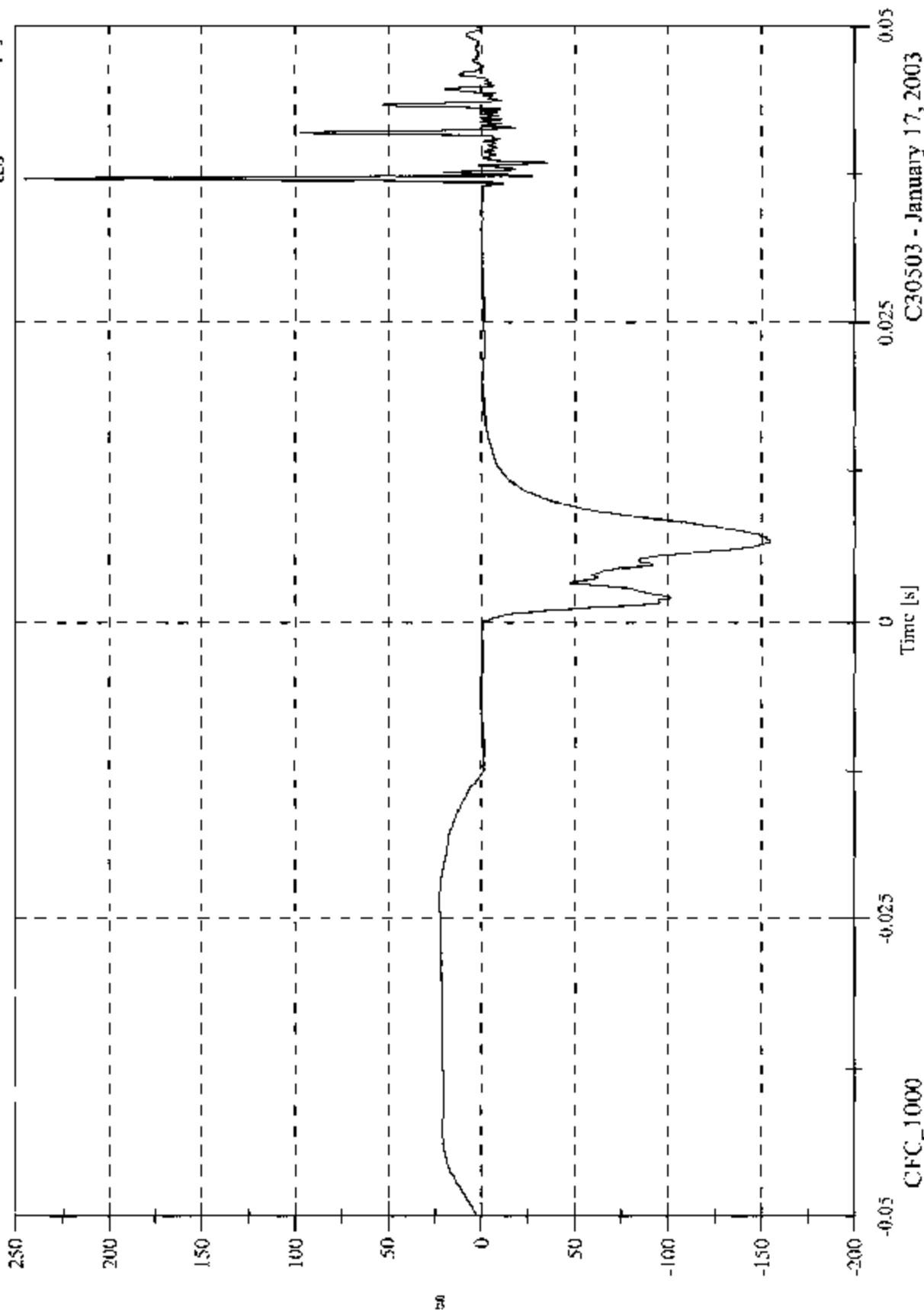
Min: 0.0 [g] at -0.094 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 245.3 [g] at 0.037 [s]  
Min: -154.0 [g] at 0.007 [s]



C30503 - January 17, 2003

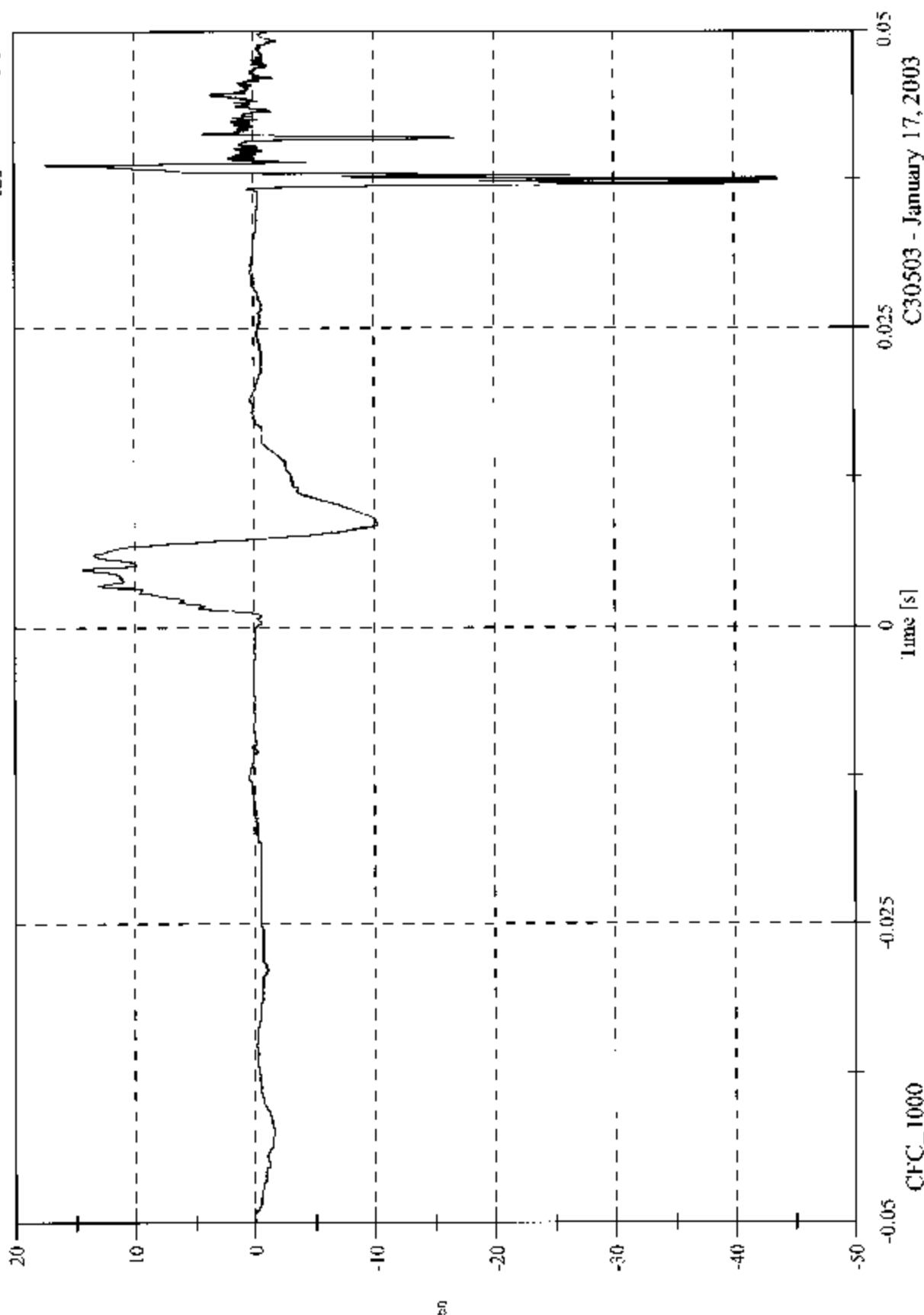


FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Y Acceleration

Max: 17.4 [g] at 0.039 [s]

Min: -43.7 [g] at 0.038 [s]

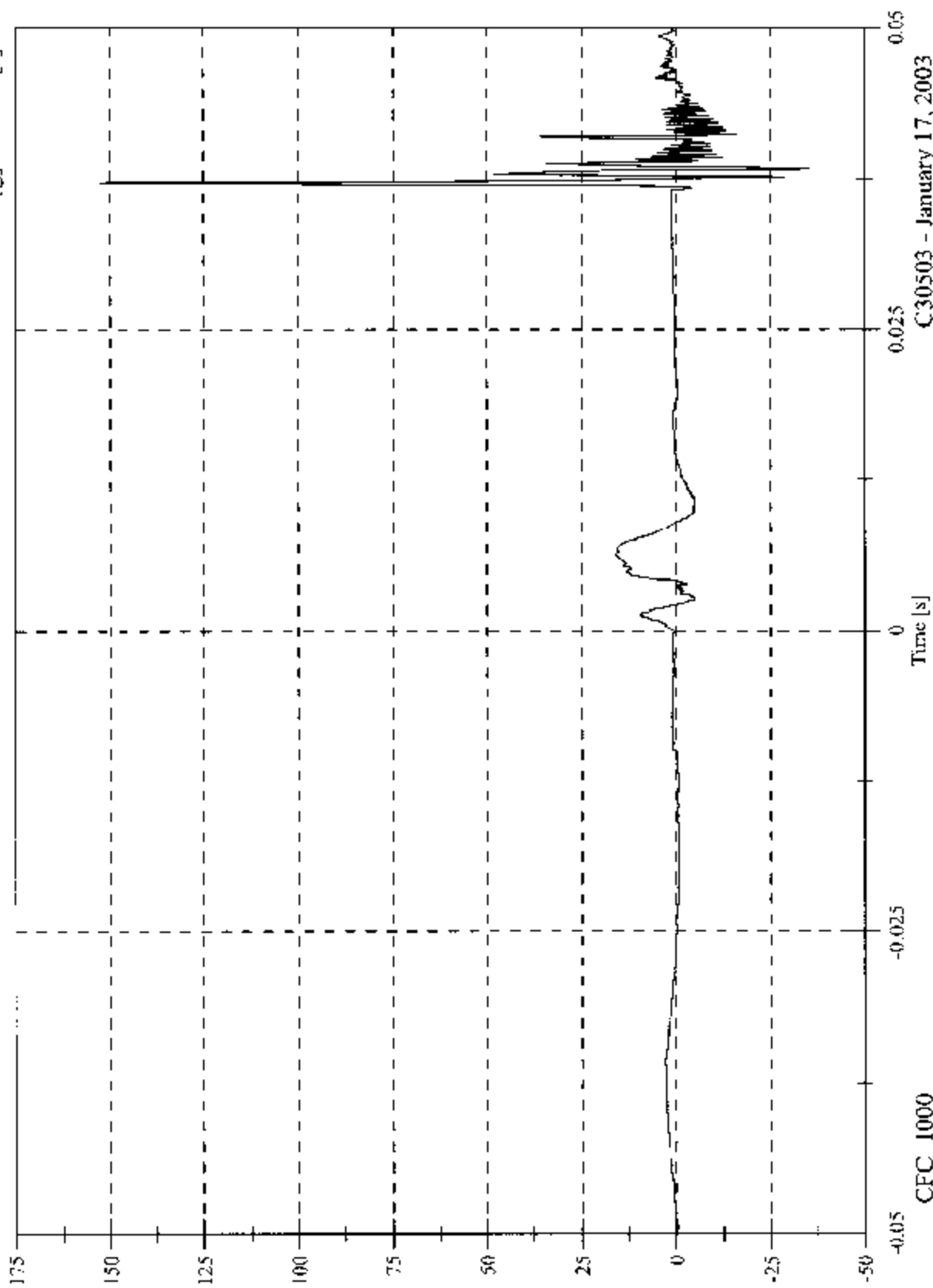


C30503 - January 17, 2003

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Z Acceleration

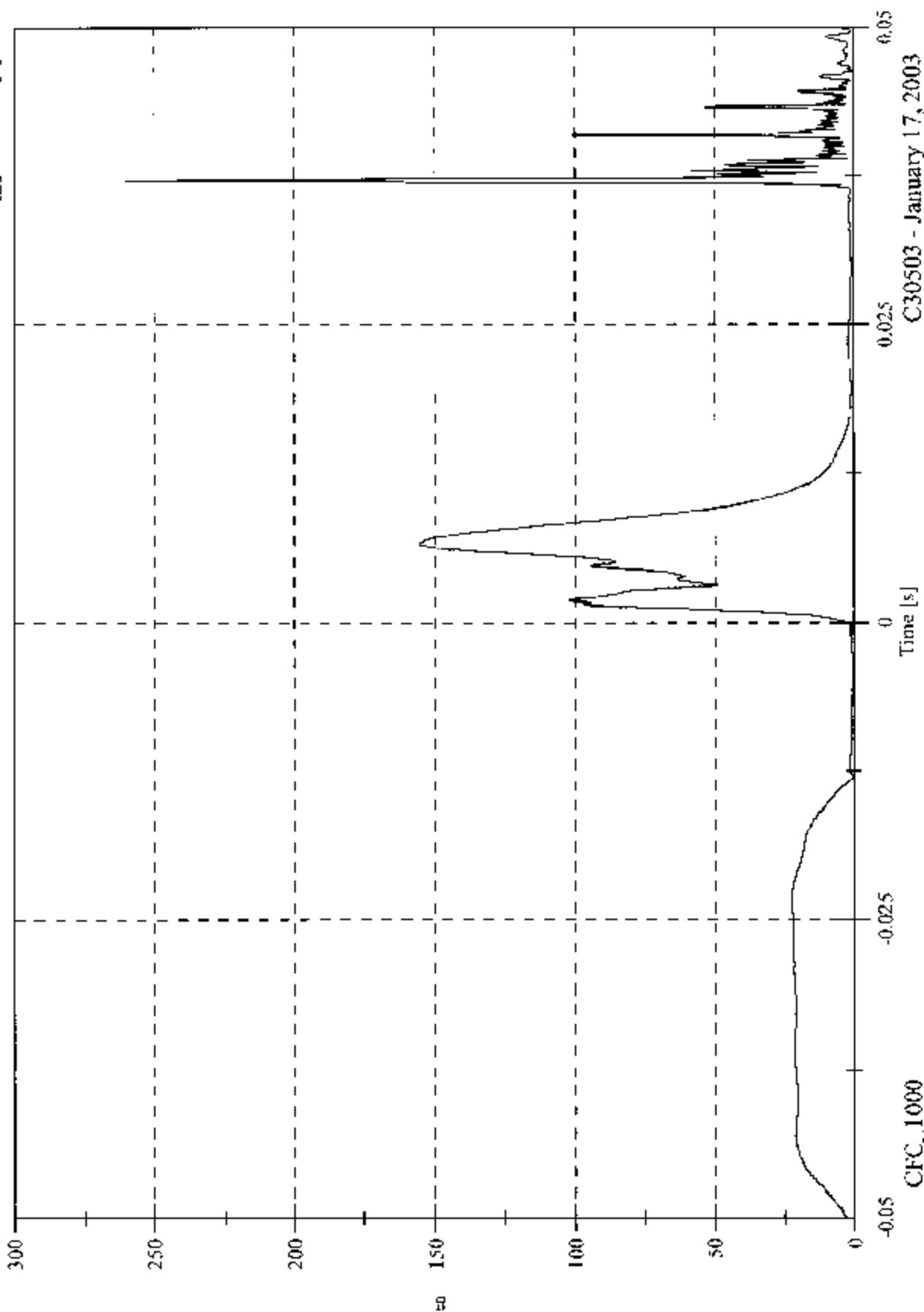
Max: 152.7 [g] at 0.037 [s]  
Min: -35.1 [g] at 0.038 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Resultant

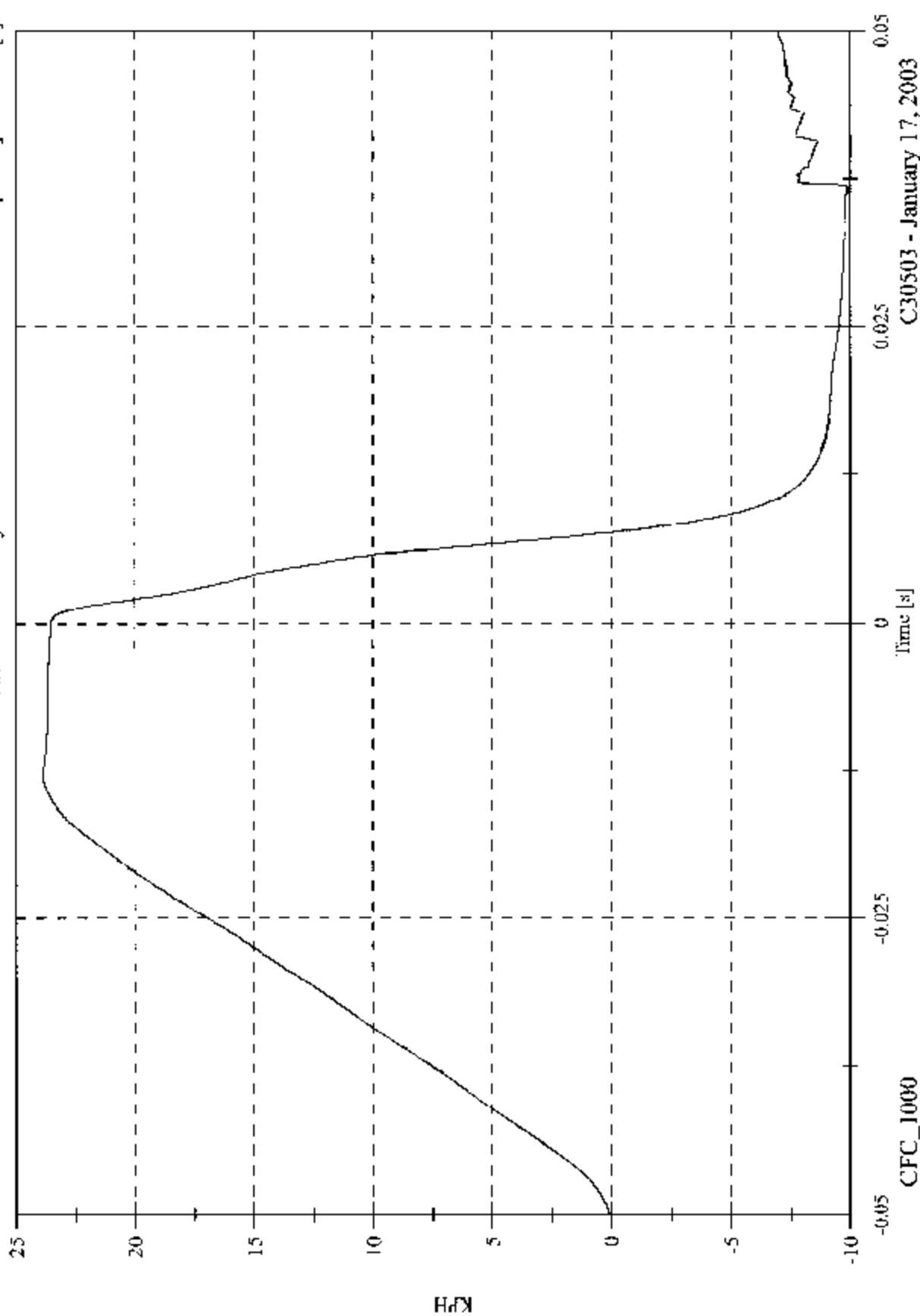
Max: 260.6 [g] at 0.037 [s]  
Min: 0.3 [g] at 0.046 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 23.9 [KPH] at -0.013 [s]  
 Min: -9.9 [KPH] at 0.037 [s]

Headform Velocity

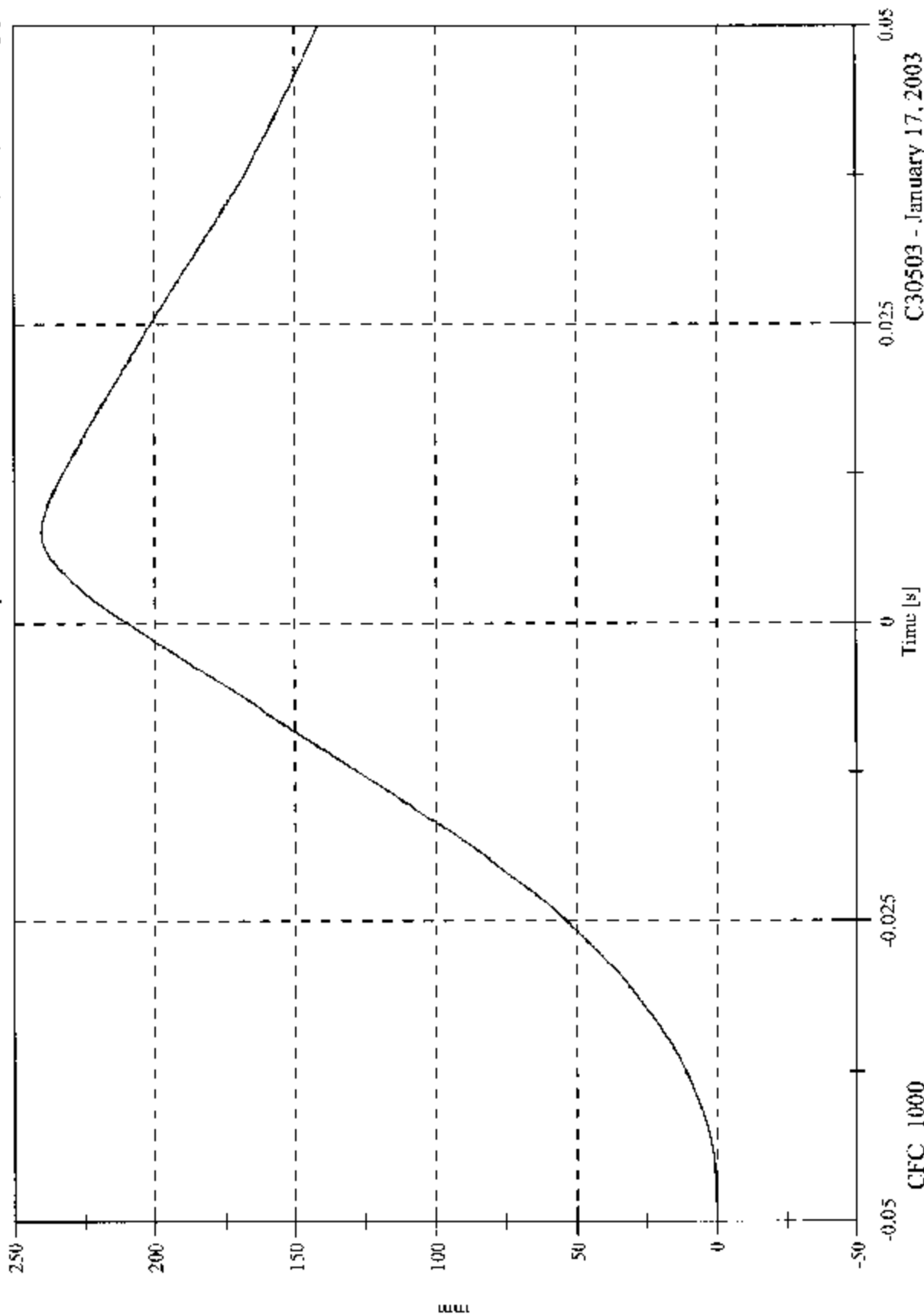


CFC\_1000

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 240.6 [mm] at 0.008 [s]  
Min: -0.1 [mm] at -0.050 [s]

Headform Displacement



C30503 - January 17, 2003



Figure : PRE-TEST AP2



Figure 1. POST-TEST AP2

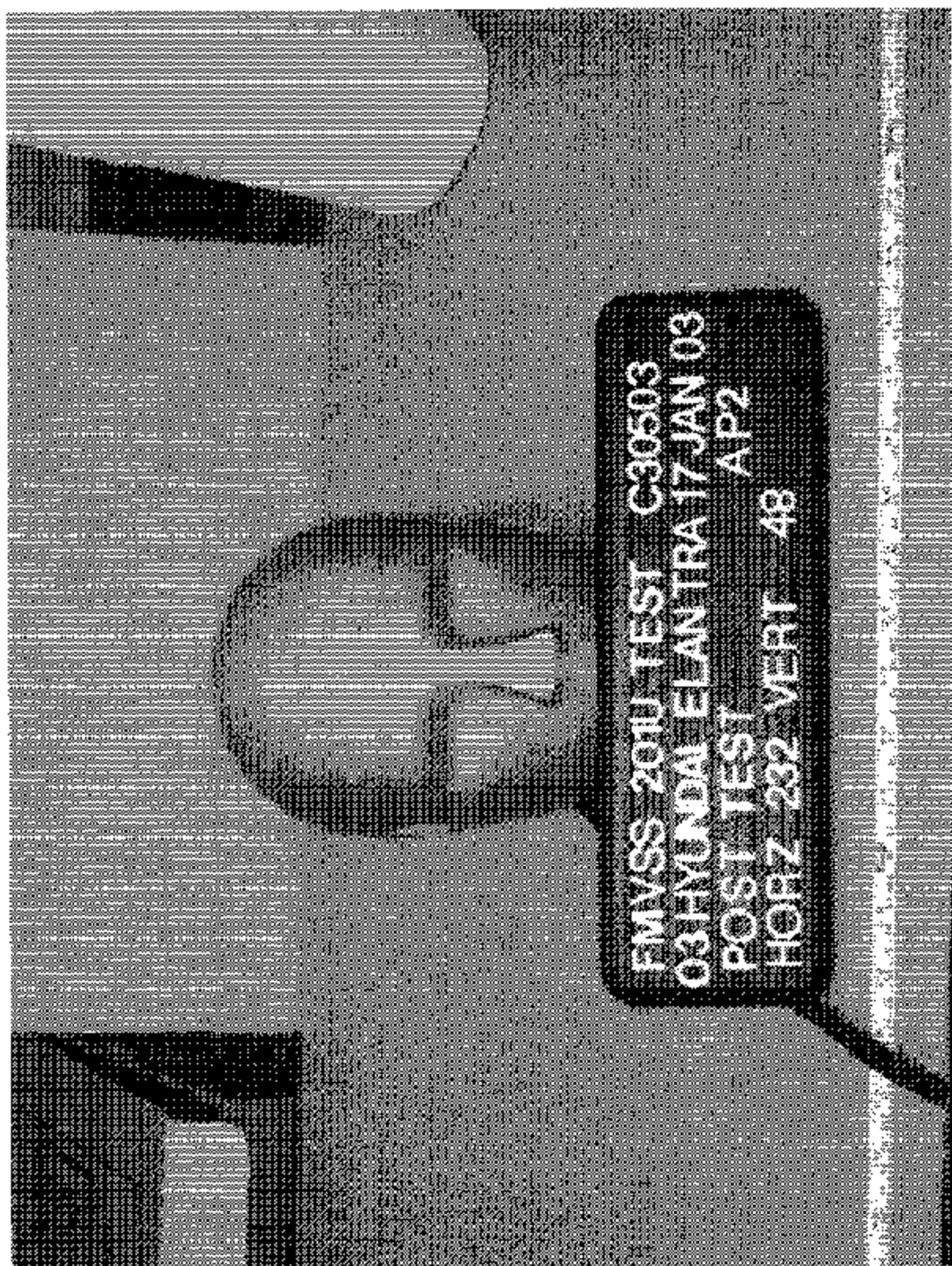


Figure : AP2 HEADFORM



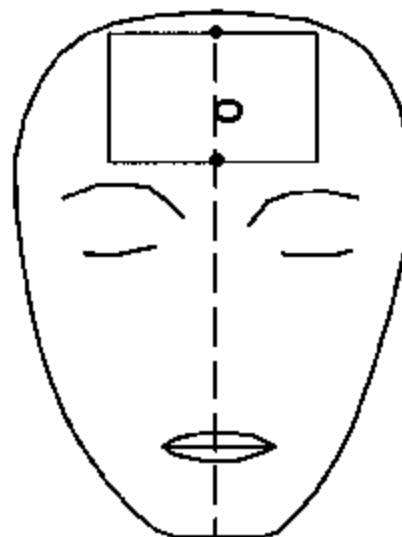
Year/Make/Model/Body Style: 2003 Hyundai Elantra 4-door Sedan  
 Vehicle Body Color: Black VIN: KMHNDN45D73L 509422  
 Vehicle NHTSA No.: C30503 Month & Year of Manufacture: 09/02

Test Number: 11 Test Date: January 17, 2003  
 Target Location: Side Rail Target Code: SR1  
 Horizontal Impact Angle: 270 ° Vertical Impact Angle: 21 °  
 Ambient Temperature: 21 °C Time of Impact: 1:30  
 Headform Number: 805

### Impact Point:

Description:

|                                  |    |       |          |           |
|----------------------------------|----|-------|----------|-----------|
| Description: From lower midpoint |    |       |          |           |
| On centerline                    | 23 | mm up |          |           |
| On centerline                    | 4  | -     | mm right | x mm left |



Free Motion HIC: 790.0 HIC(d): 762.5  
 Impact Velocity (kph): 23.49 HIC1: 1.4 msec HIC2: 7.4 msec

Post-Test Comments:

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA C30503 - SR1

FMH Headform 805

Location: SR1

Test Date: January 17, 2003

Work File: SR1

## -----TEST RESULTS-----

Lab Temperature: 21 C

HICd: 762.5

Lab Humidity: 12 %

HIC (36ms): 790.0

Velocity at Impact: 23.49 KPH

t1: 1.4 msec

t2: 7.4 msec

Free Flight Distance: 215.73 mm

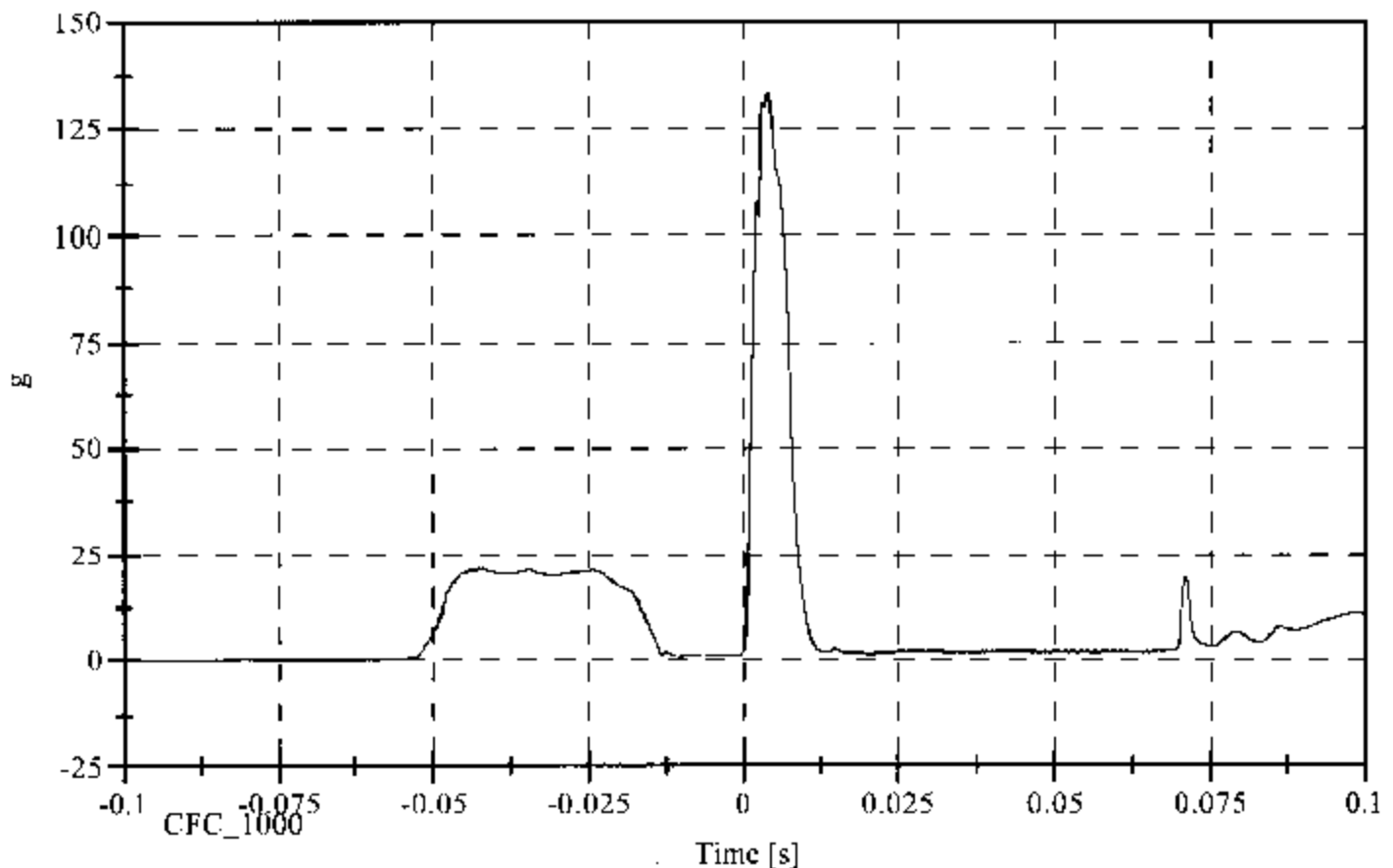
Duration: 6.0 msec

Average Acceleration: 9.2 g

FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA  
Headform Resultant

Max: 133.5 [g] at 0.004 [s]

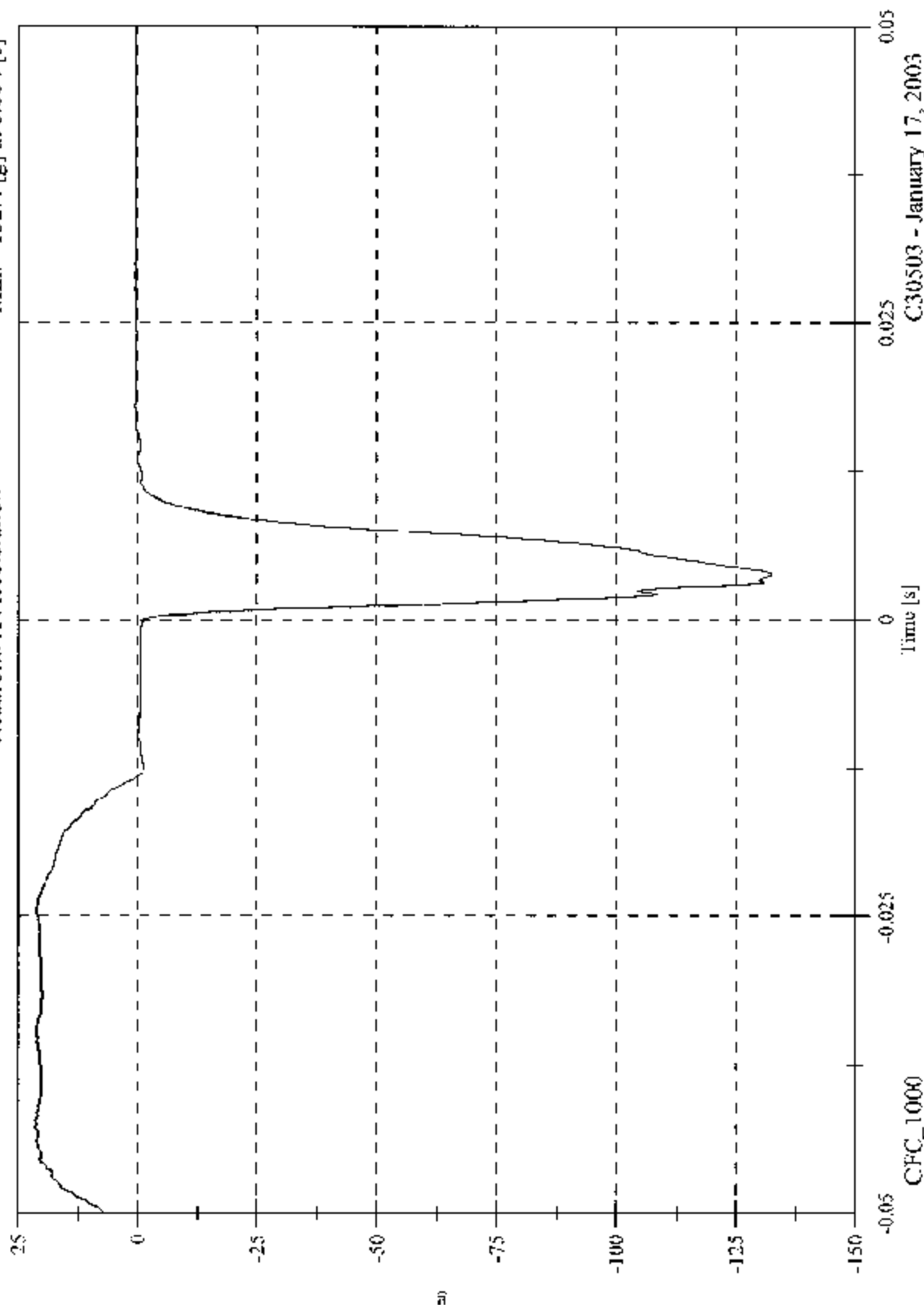
Min: -0.0 [g] at -0.099 [s]



FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform X Acceleration

Max: 21.4 [g] at -0.043 [s]  
Min: -132.4 [g] at 0.004 [s]

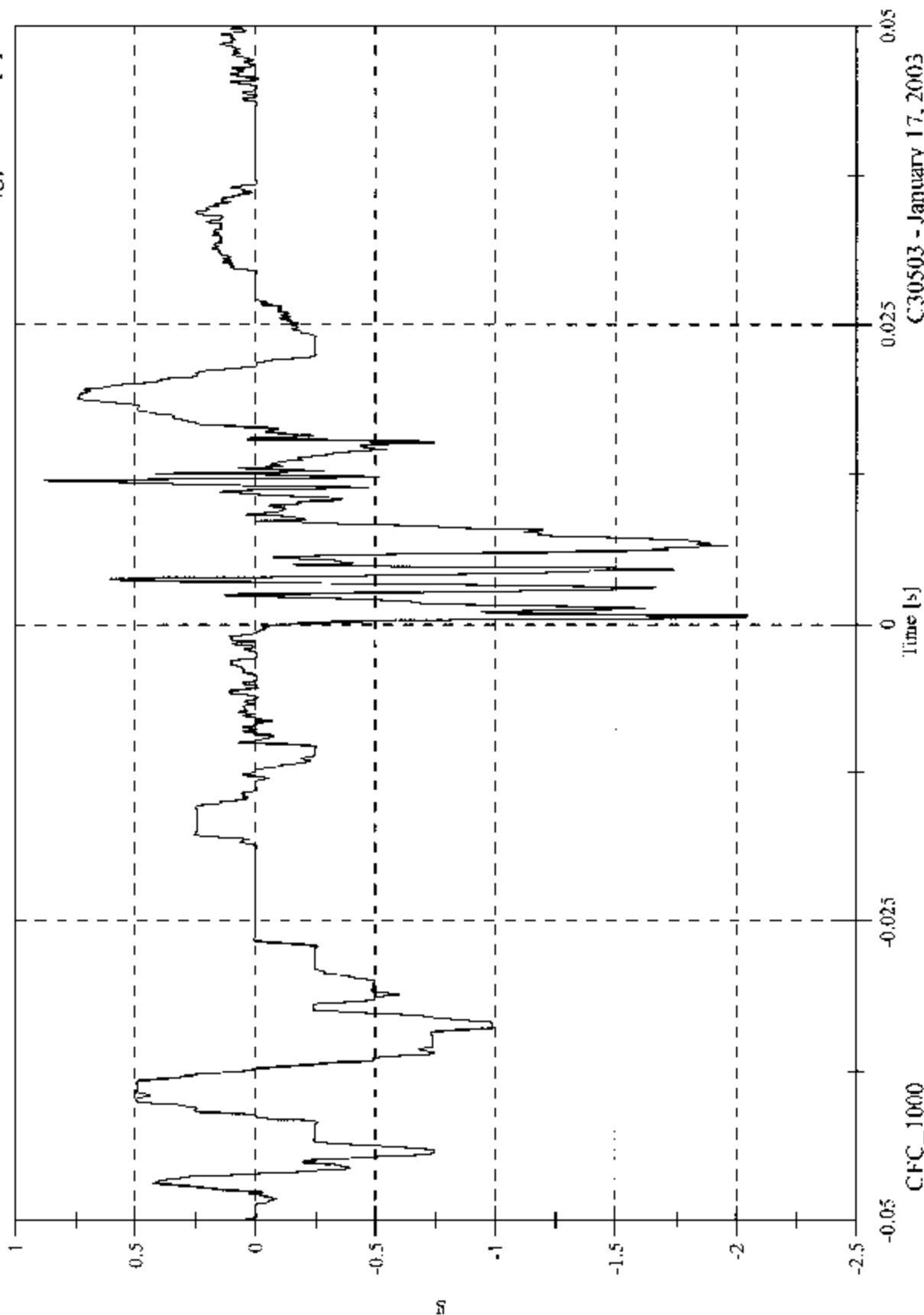


C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Y Acceleration

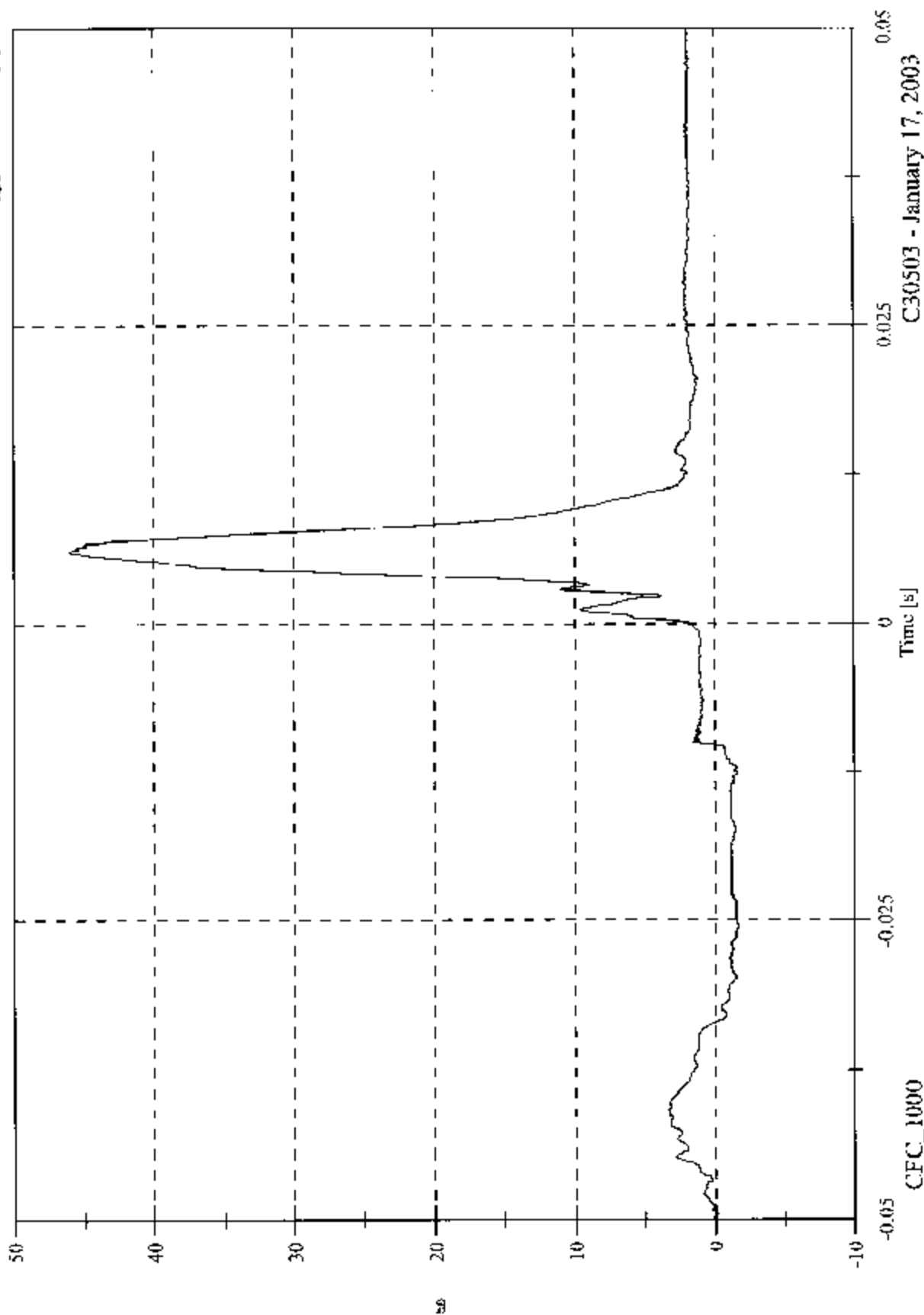
Max: 0.9 [g] at 0.012 [s]  
Min: -2.0 [g] at 0.001 [s]



# FMVSS 201U IMPACT TEST - 2003 HYUNDAI FLANTRA

Headform Z Acceleration

Max: 46.1 [g] at 0.006 [s]  
Min: -1.7 [g] at -0.026 [s]



CFC\_1000

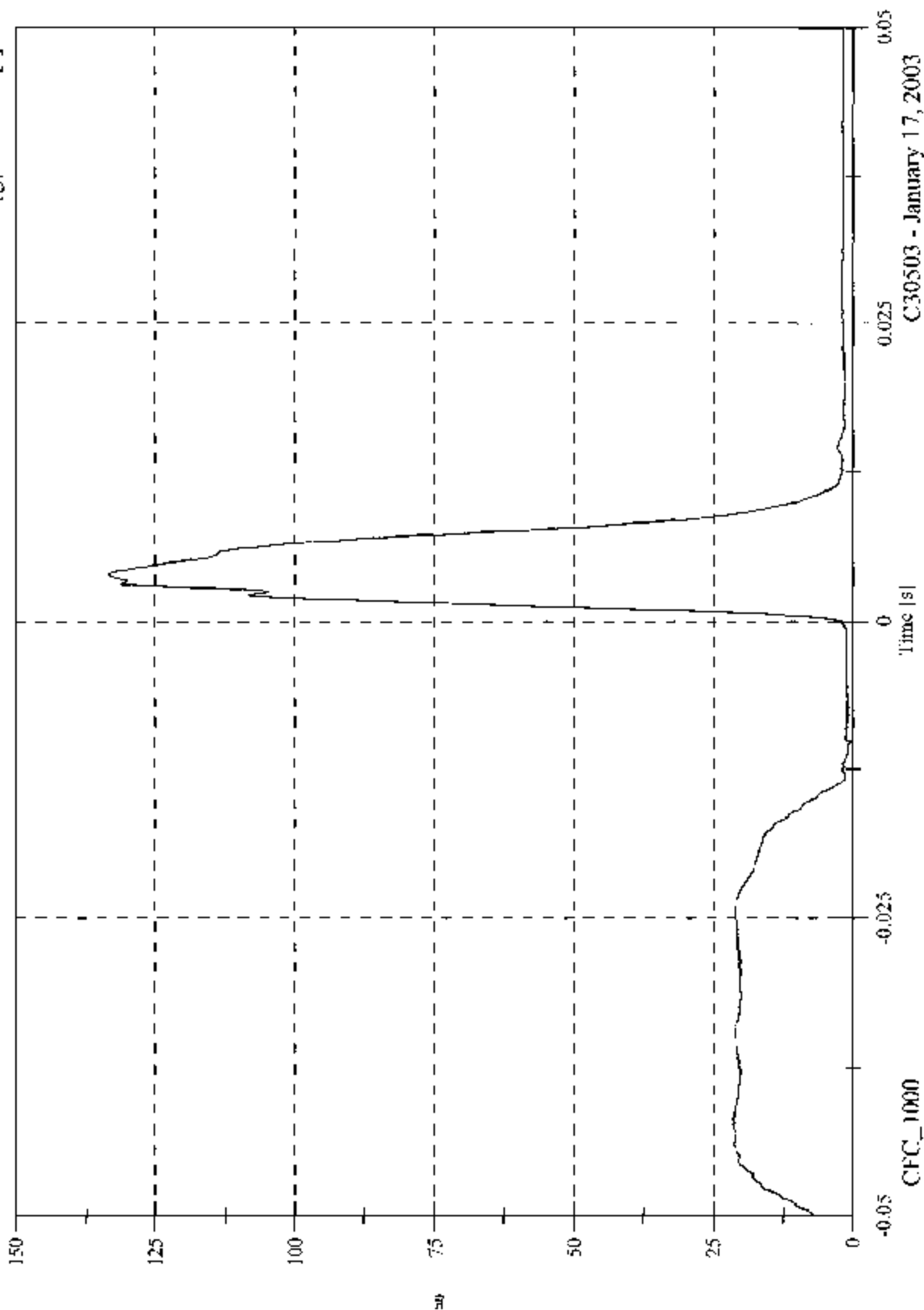
Time [s]

C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Resultant

Max: 133.5 [g] at 0.004 [s]  
Min: 0.3 [g] at -0.010 [s]

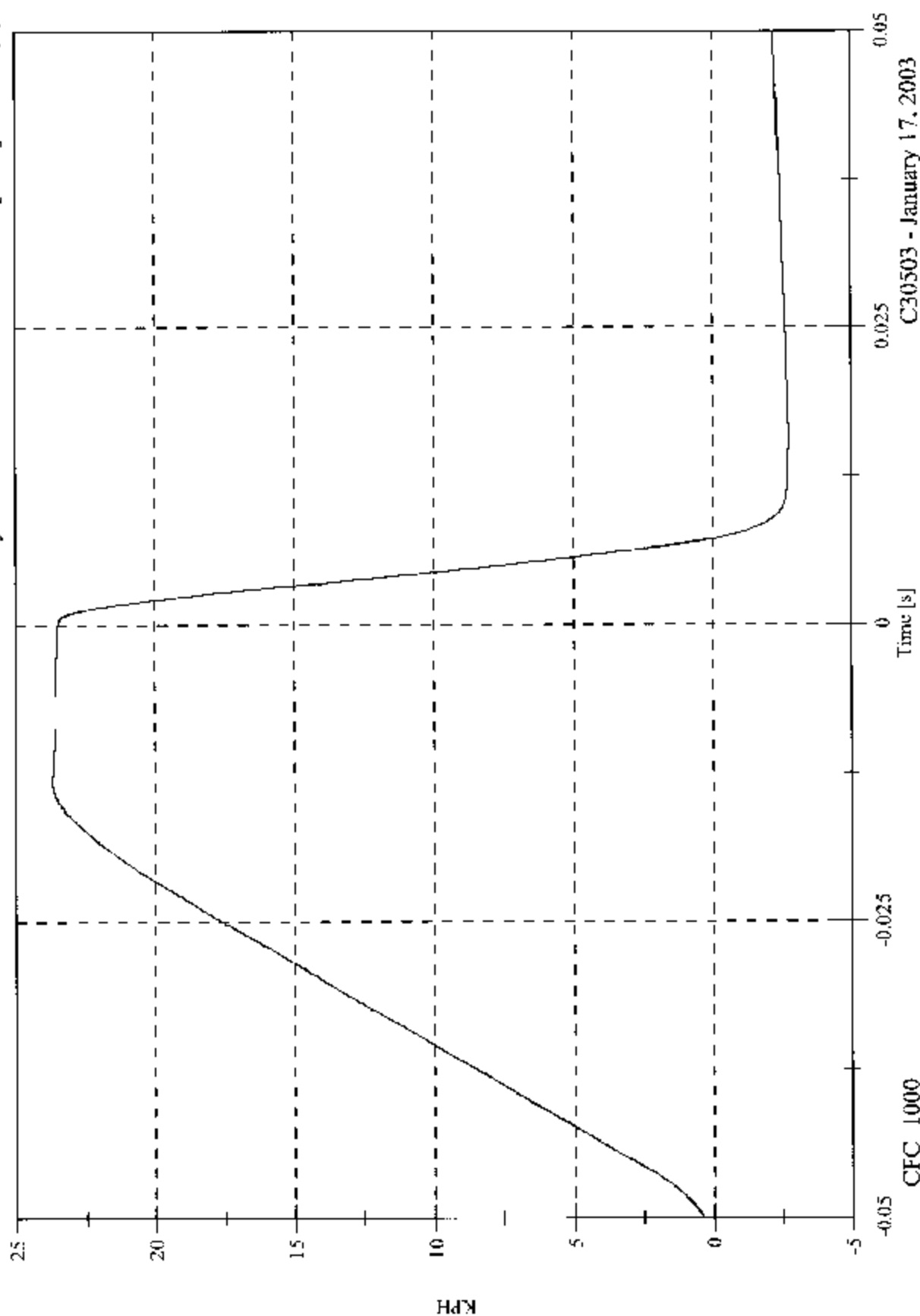


C30503 - January 17, 2003

FMVSS 2010 IMPACT TEST - 2003 HYUNDAI ELANTRA

Headform Velocity

Max: 23.7 [KPH] at -0.013 [s]  
Min: -2.7 [KPH] at 0.016 [s]



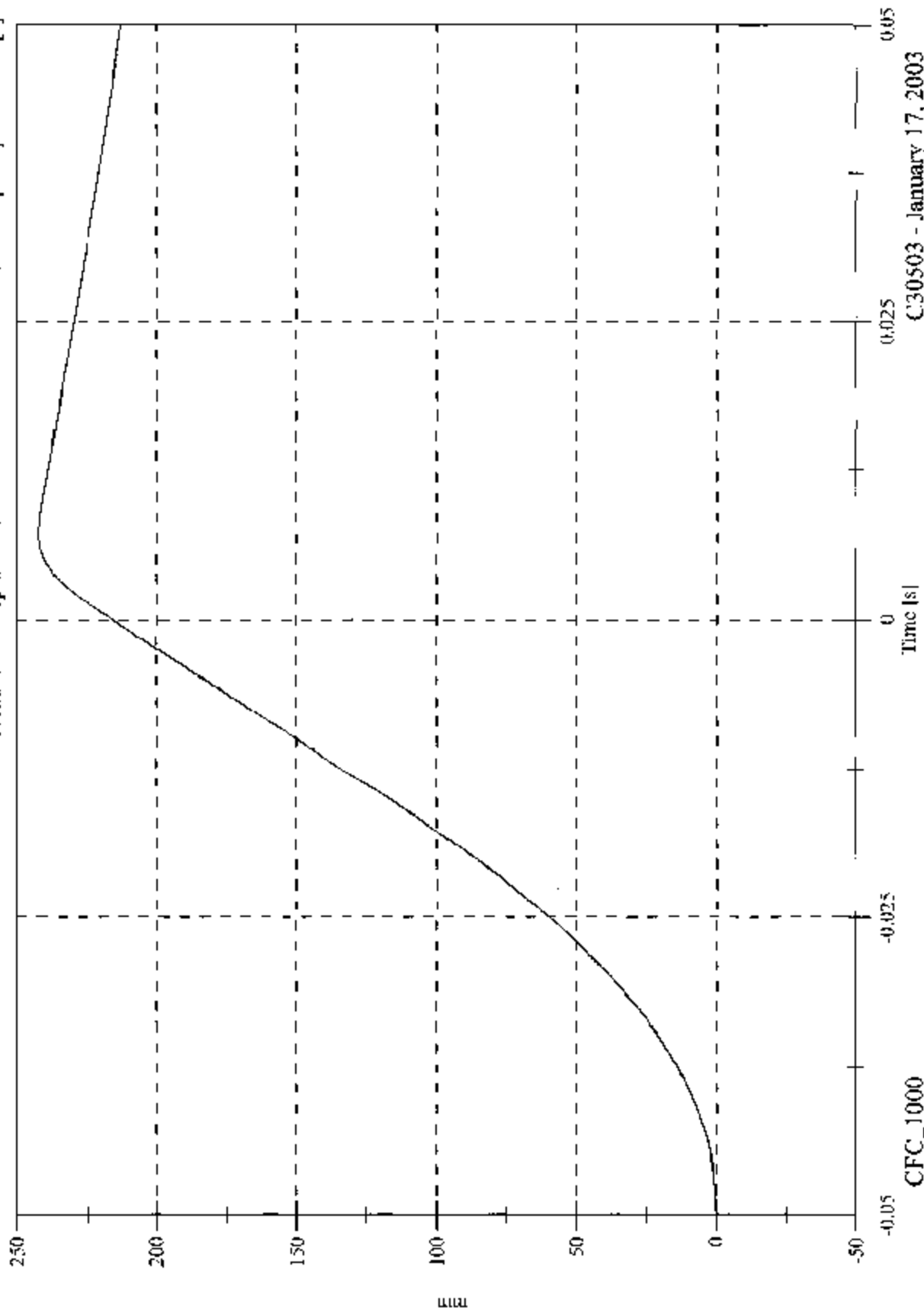
CFC\_1000

C30503 - January 17, 2003

# FMVSS 201U IMPACT TEST - 2003 HYUNDAI ELANTRA

Max: 242.3 [mm] at 0.007 [s]  
Min: -0.0 [mm] at -0.050 [s]

Headform Displacement



CFC\_1000



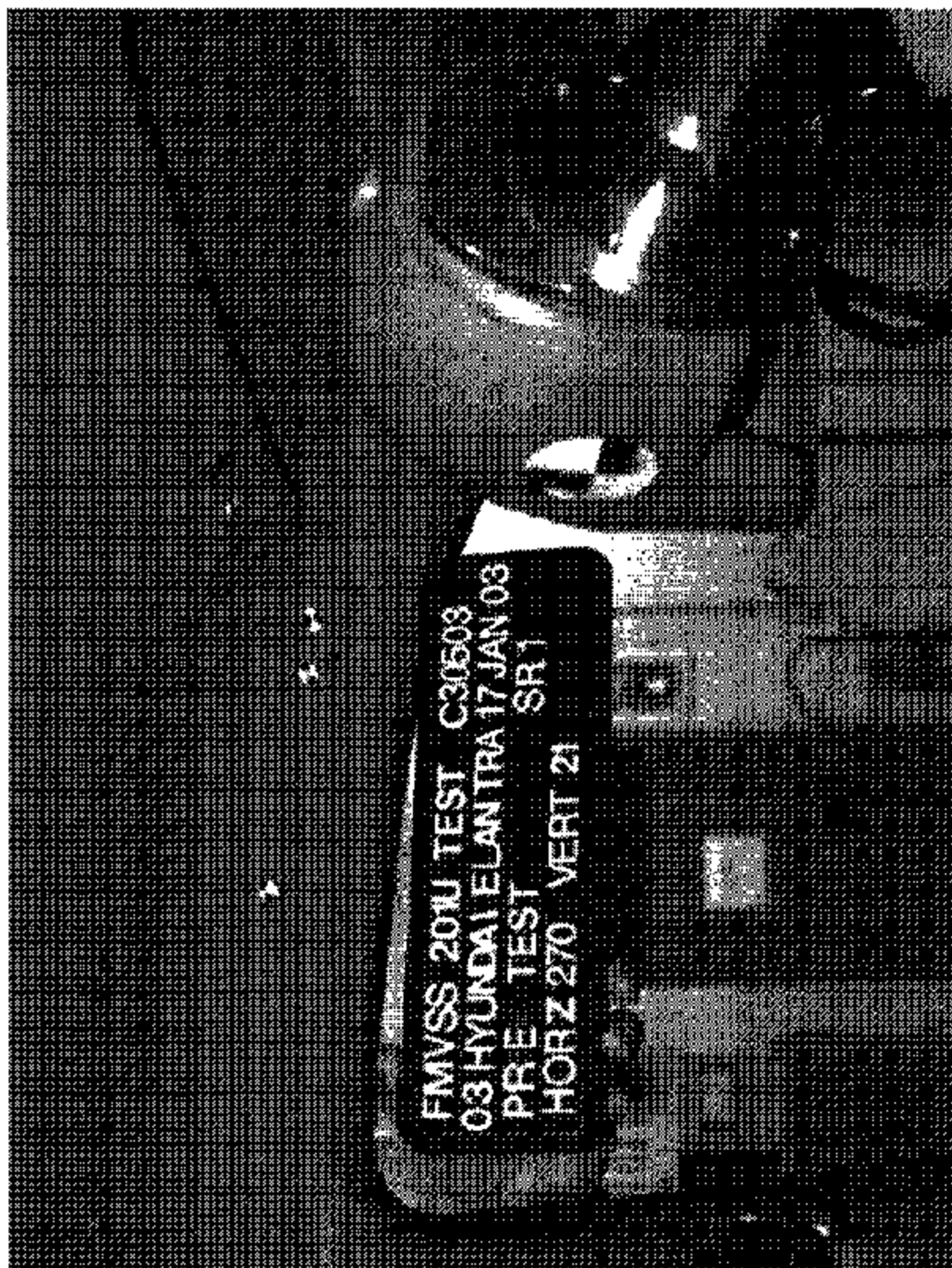
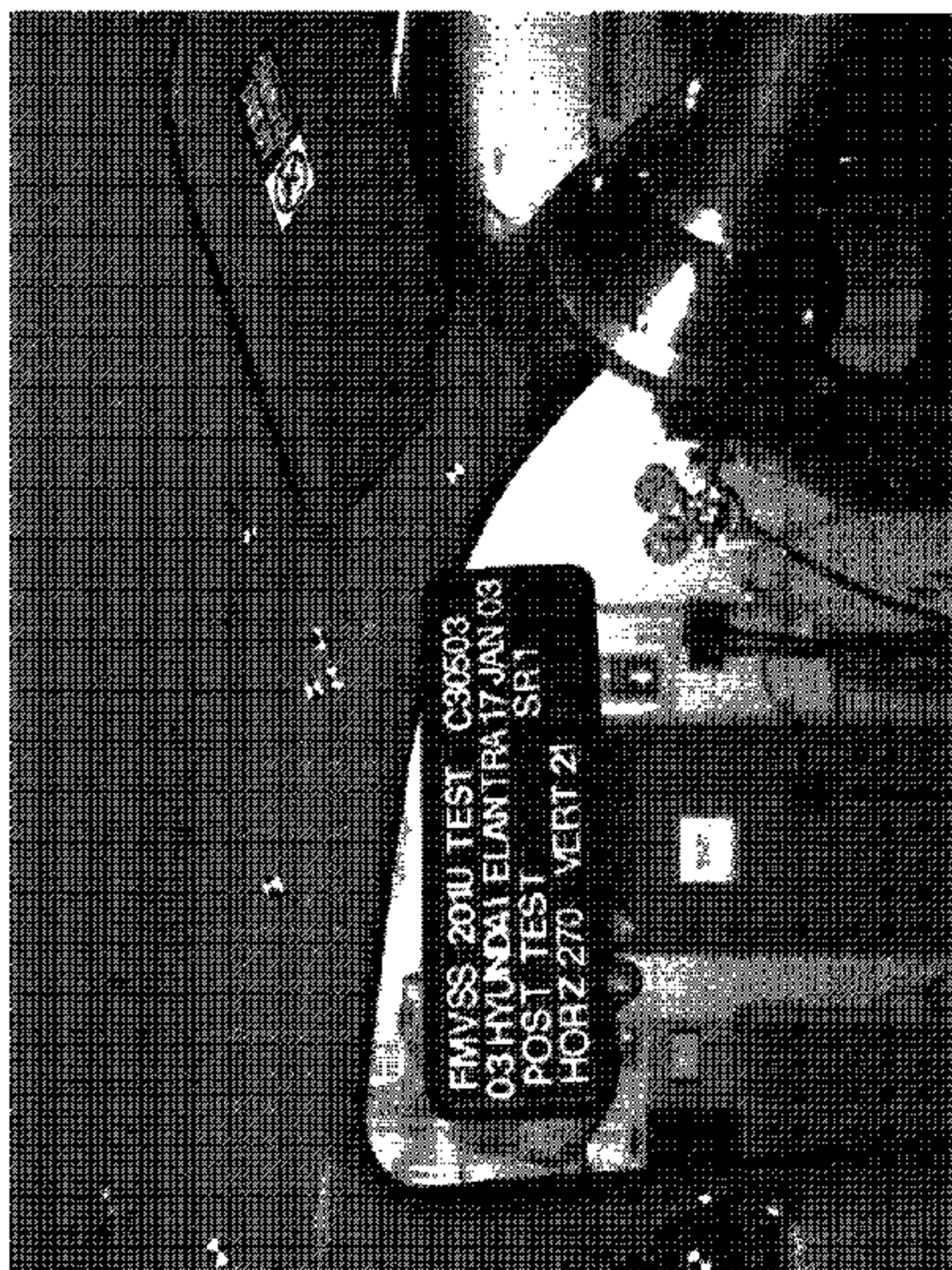


Figure PRE-TEST SR1



1 page PRINT TEST-RI

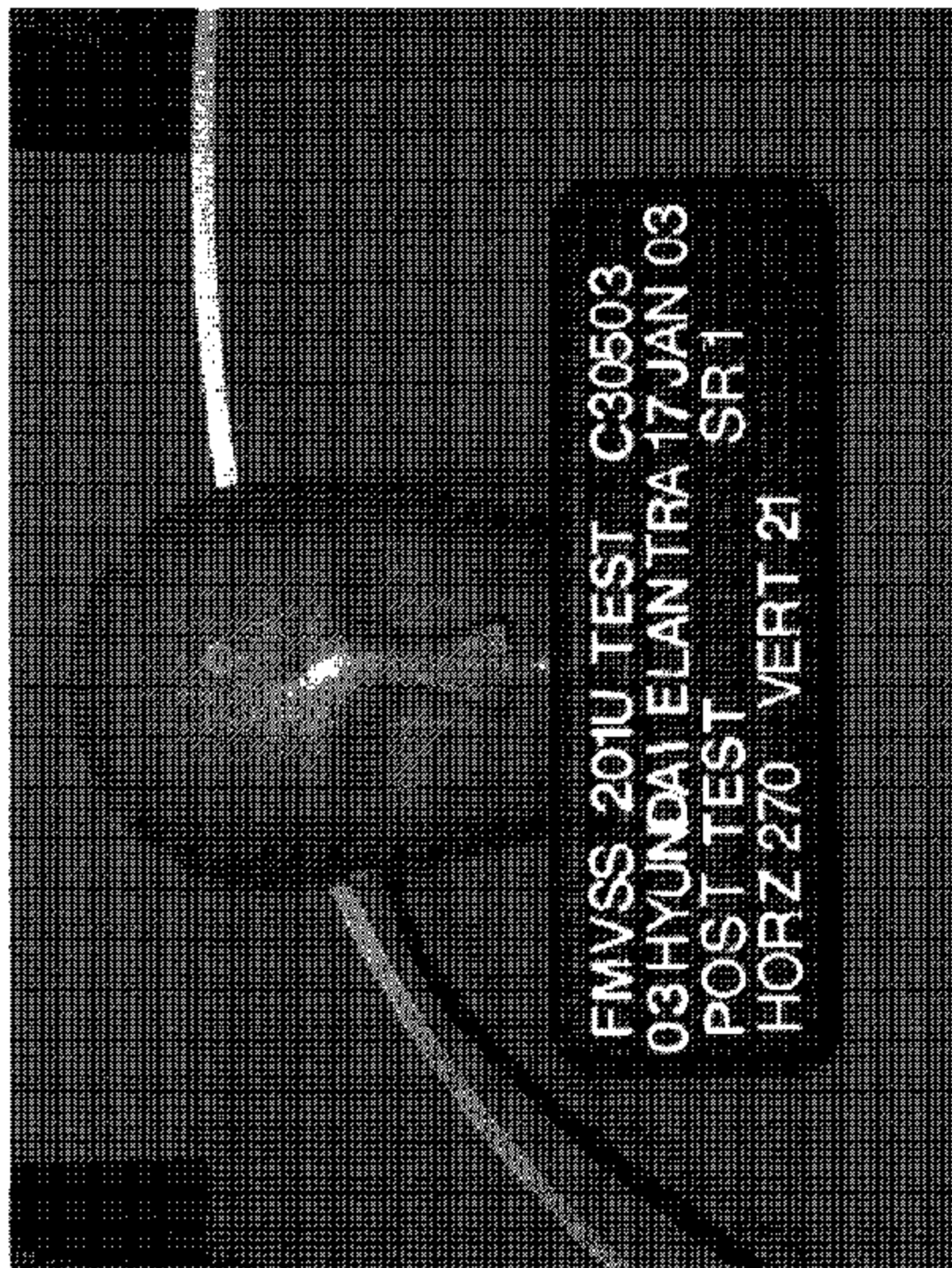


Figure : SR1 HEADFORM

**APPENDIX A**  
**PHOTOGRAPHS**

# PHOTOGRAPHS

| <b>FIGURE</b> | <b>VIEW</b>                                |
|---------------|--------------------------------------------|
|               |                                            |
| A-1           | LEFT SIDE VIEW OF VEHICLE                  |
| A-2           | RIGHT SIDE VIEW OF VEHICLE                 |
| A-3           | 3/4 FRONTAL VIEW FROM LEFT SIDE OF VEHICLE |
| A-4           | 3/4 REAR VIEW FROM RIGHT SIDE OF VEHICLE   |
| A-5           | VEHICLE'S CERTIFICATION LABEL              |
| A-6           | VEHICLE'S TIRE INFORMATION LABEL           |
| A-7           | PRE-TEST DRIVER SIDE A-PILLAR              |
| A-8           | PRE-TEST DRIVER SIDE FRONT HEADER          |
| A-9           | PRE-TEST DRIVER SIDE SIDE RAIL             |
| A-10          | PRE-TEST DRIVER SIDE B-PILLAR              |
| A-11          | PRE-TEST DRIVER SIDE REAR PILLAR           |
| A-12          | PRE-TEST PASSENGER SIDE A-PILLAR           |
| A-13          | PRE-TEST PASSENGER SIDE FRONT HEADER       |
| A-14          | PRE-TEST PASSENGER SIDE SIDE RAIL          |
| A-15          | PRE-TEST PASSENGER SIDE B-PILLAR           |
| A-16          | PRE-TEST PASSENGER SIDE REAR PILLAR        |
| A-17          | POST-TEST DRIVER SIDE A-PILLAR             |
| A-18          | POST-TEST DRIVER SIDE FRONT HEADER         |
| A-19          | POST-TEST DRIVER SIDE SIDE RAIL            |
| A-20          | POST-TEST DRIVER SIDE B-PILLAR             |
| A-21          | POST-TEST DRIVER SIDE REAR PILLAR          |
| A-22          | POST-TEST PASSENGER SIDE A-PILLAR          |
| A-23          | POST-TEST PASSENGER SIDE FRONT HEADER      |
| A-24          | POST-TEST PASSENGER SIDE SIDE RAIL         |
| A-25          | POST-TEST PASSENGER SIDE B-PILLAR          |
| A-26          | POST-TEST PASSENGER SIDE REAR PILLAR       |
|               |                                            |

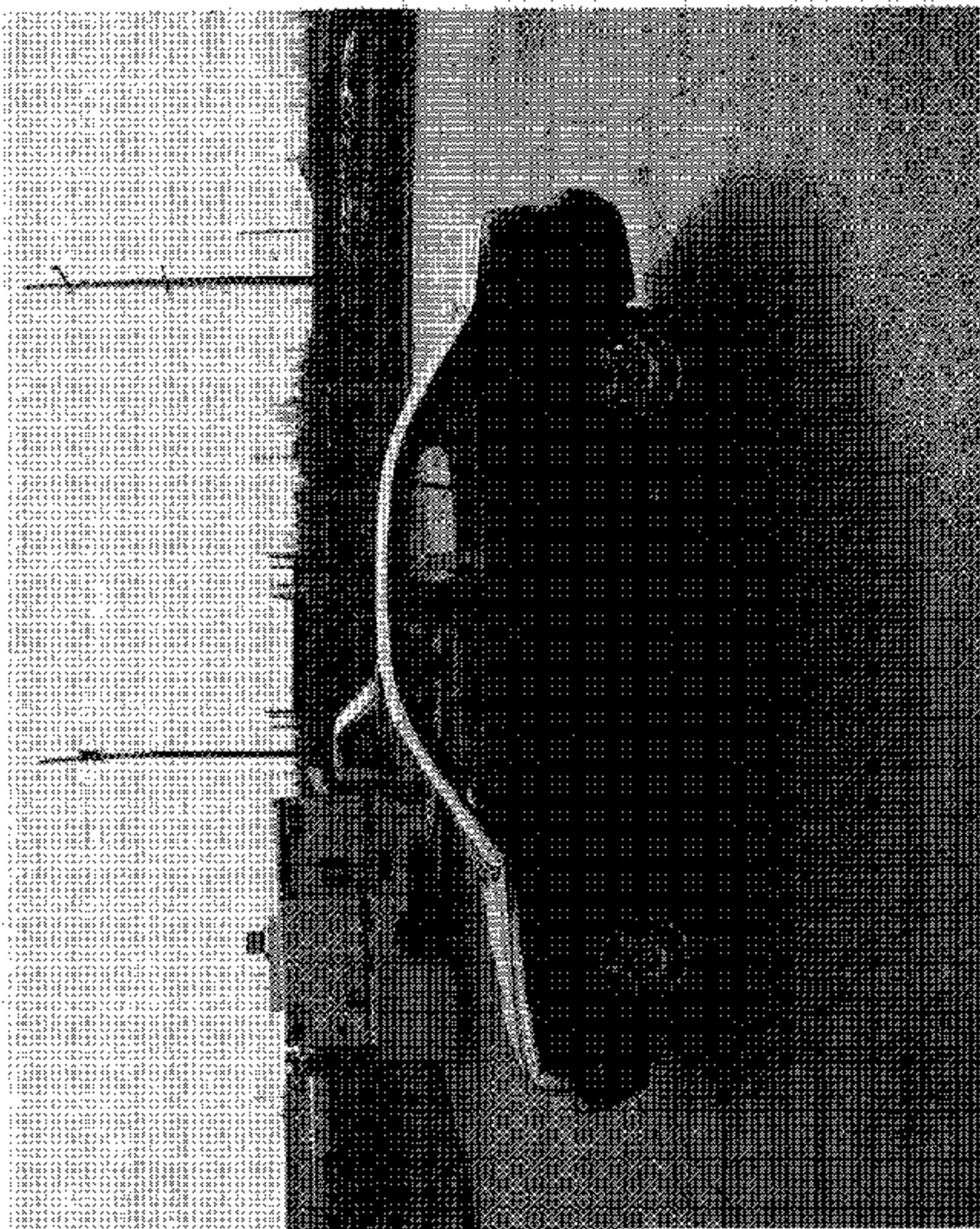


Figure A-1. LEFT SIDE VIEW OF VEHICLE



Figure A-2. RIGHT SIDE VIEW OF VEHICLE



Figure A-3. 3/4 Frontal View from Left Side of Vehicle



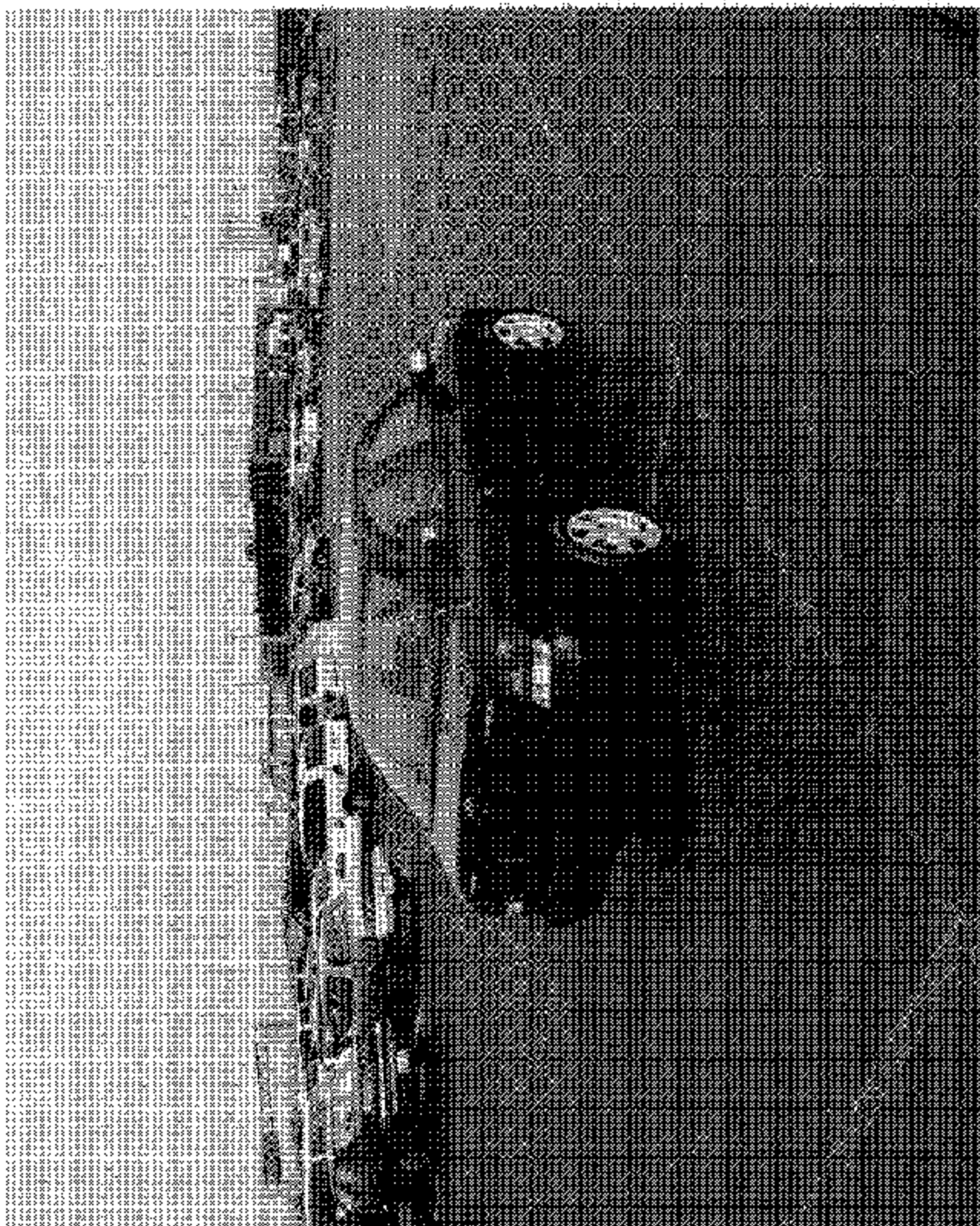


FIGURE A-4: 34 REAR VIEW FROM RIGHT SIDE OF VEHICLE

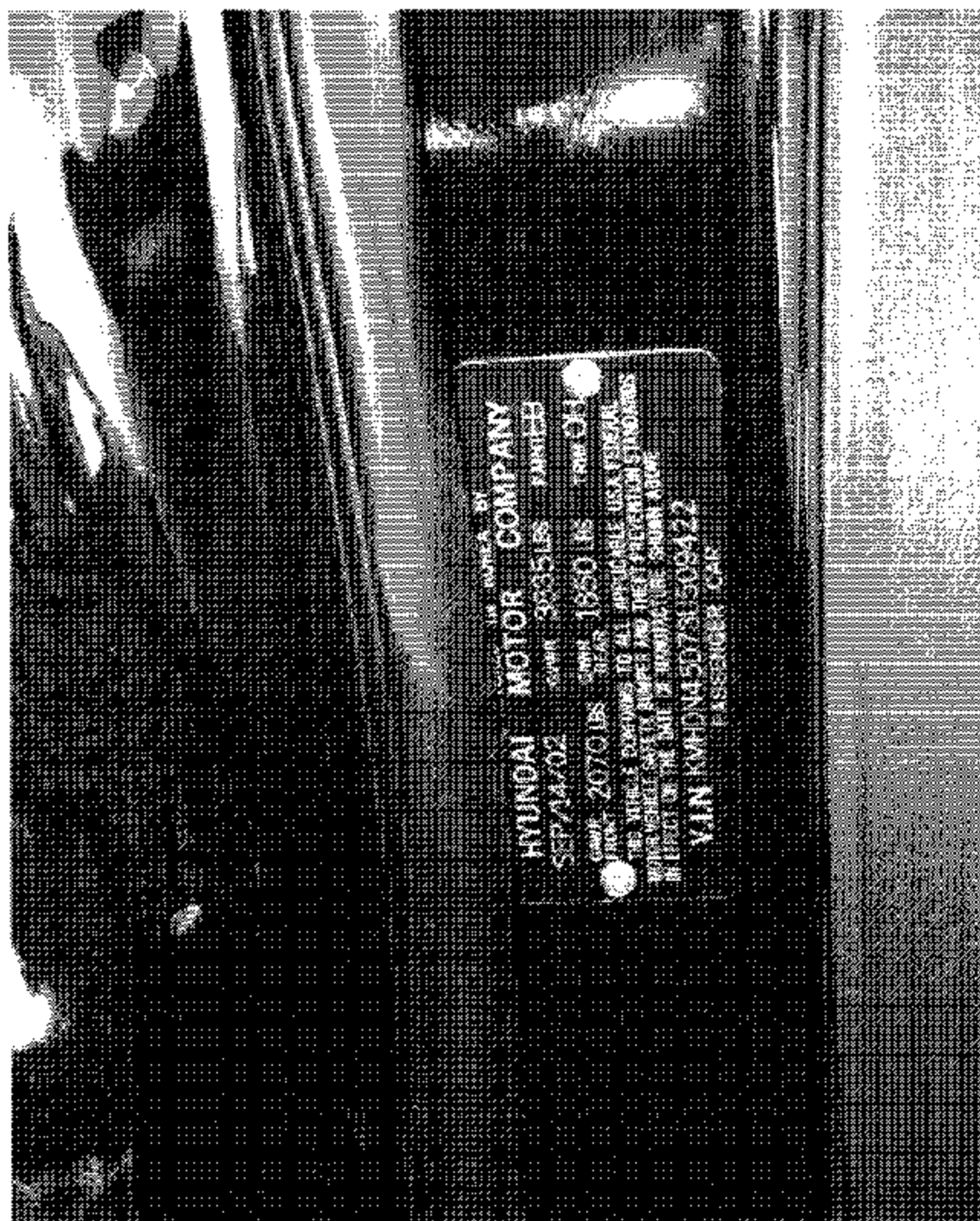


Figure A-5. VEHICLE STOPS BY YEAR

|                        |                   |         |
|------------------------|-------------------|---------|
| 1                      | TIRE INFORMATION  |         |
|                        | PASSENGER (50% D) |         |
| STANDARD RELATION      |                   |         |
| PASSENGER (50% D) LOAD |                   |         |
| 1ST SEAT 2 PASSENGERS  |                   |         |
| 2ND SEAT 3 PASSENGERS  |                   |         |
| TOTAL 5 PASSENGERS     |                   |         |
| LUGGAGE 45KG (100LBS)  |                   |         |
| VEHICLE CAPACITY WT.   |                   |         |
| 365KG (800LBS)         |                   |         |
| TIRE P195/65R15 6ET    |                   |         |
| SIZE P195/60R15 97H    |                   |         |
| FRONT                  |                   | REAR    |
| 210kPa                 |                   | 210kPa  |
| (30psi)                |                   | (30psi) |
| TIRE SIZE T125/70R15   |                   |         |
| T125/75R15             |                   |         |
| TEMPORARY USE ONLY     |                   |         |
| 420kPa                 |                   | (60psi) |

Figure A-6: VEHICLE'S TIRE INFORMATION LABEL

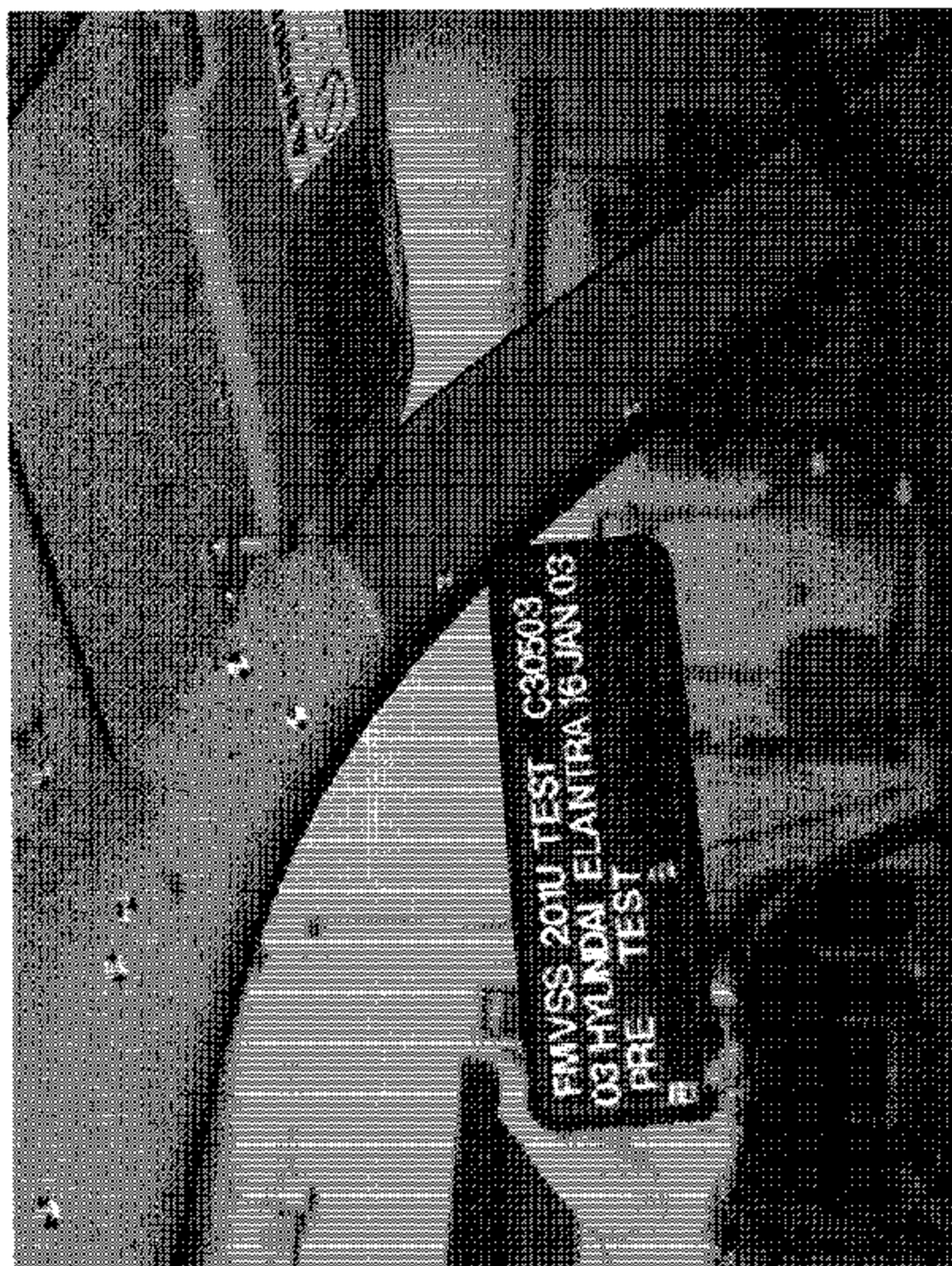


Figure A-7. PRE-TEST DRIVER SIDE A-PILLAR

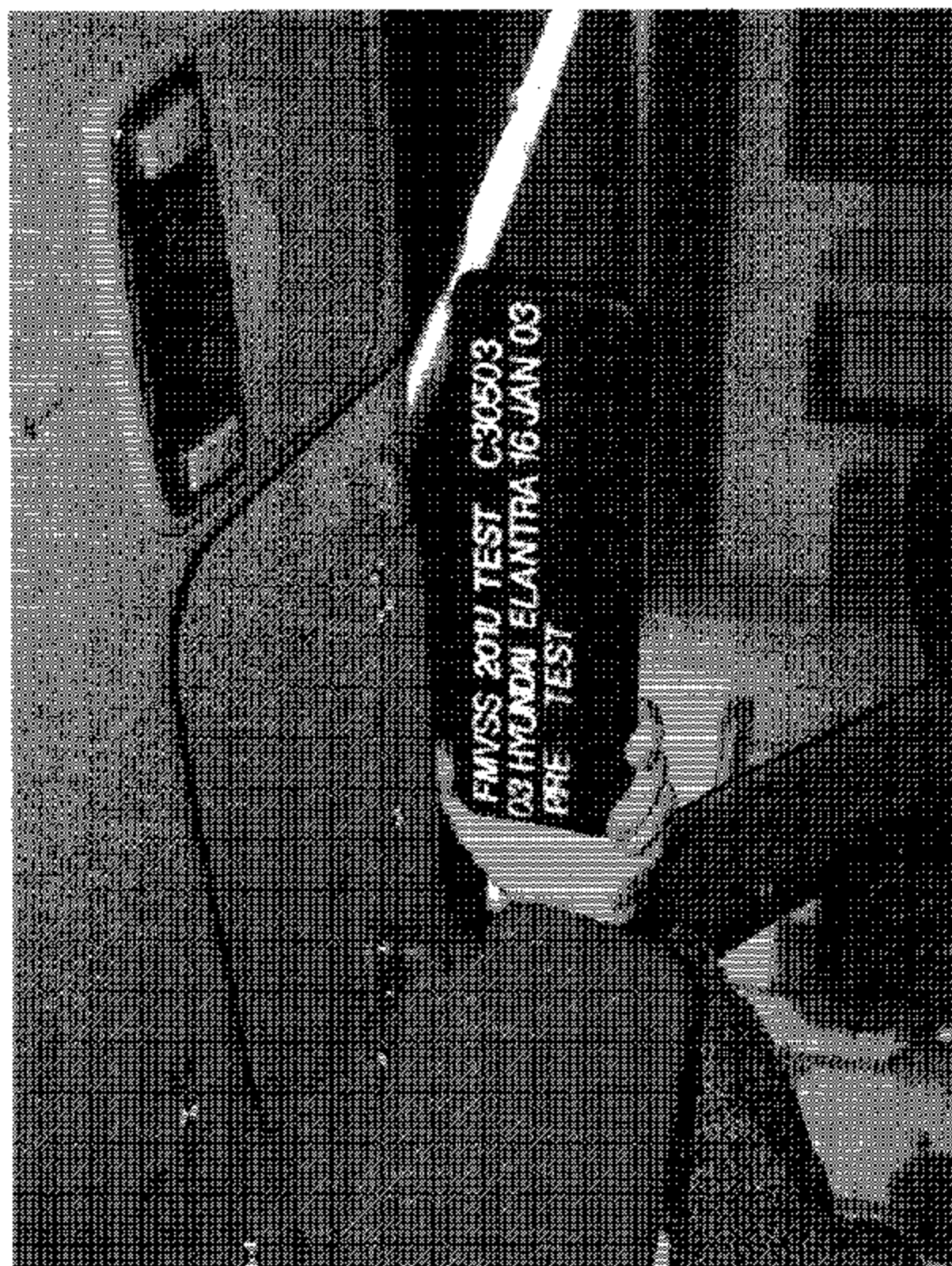


Figure A-8: PRE-TEST DRIVER SIDE FRONT READER

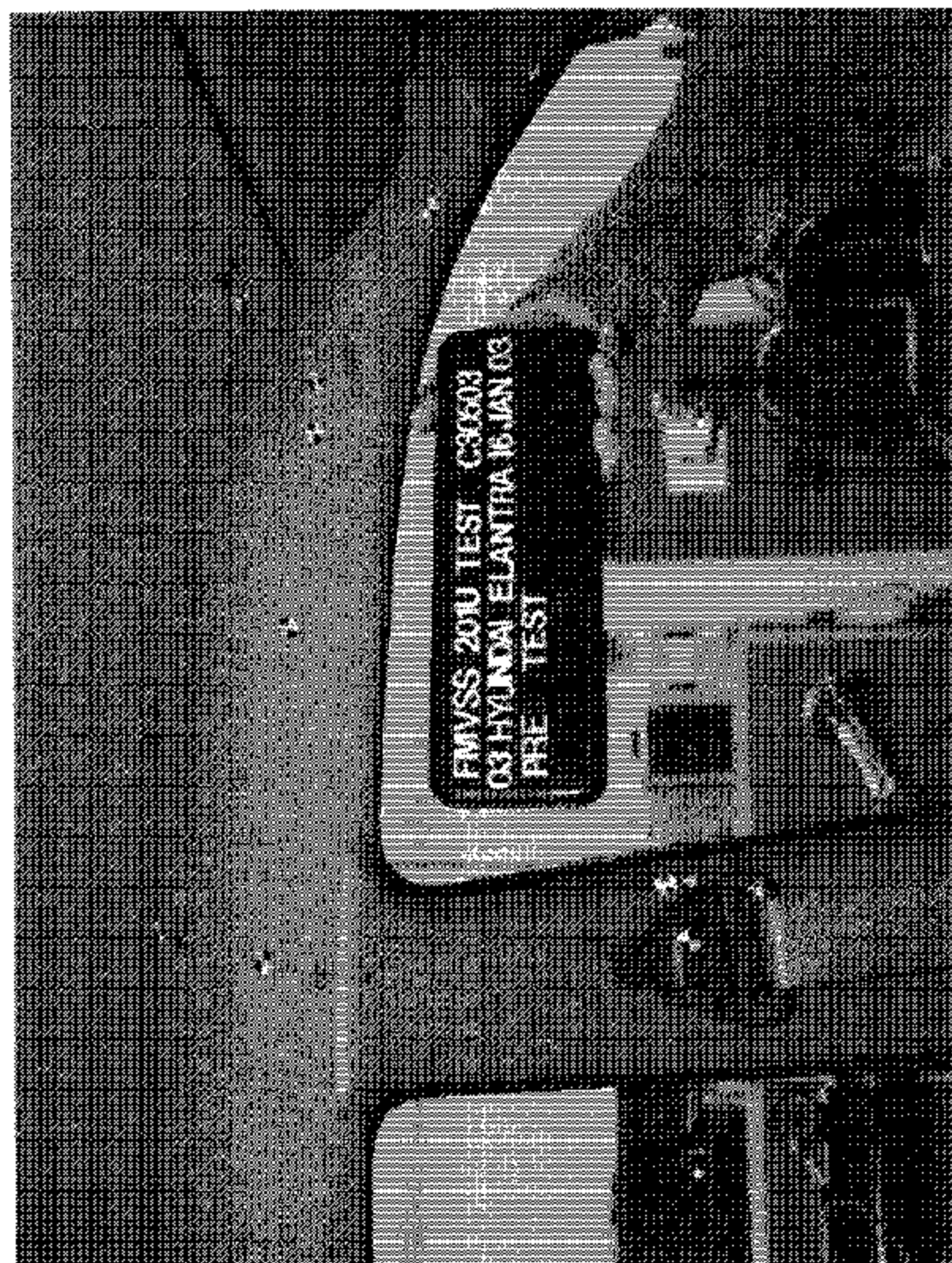


Figure A-9: PRE-TEST DRIVER SIDE SIDE RAIL

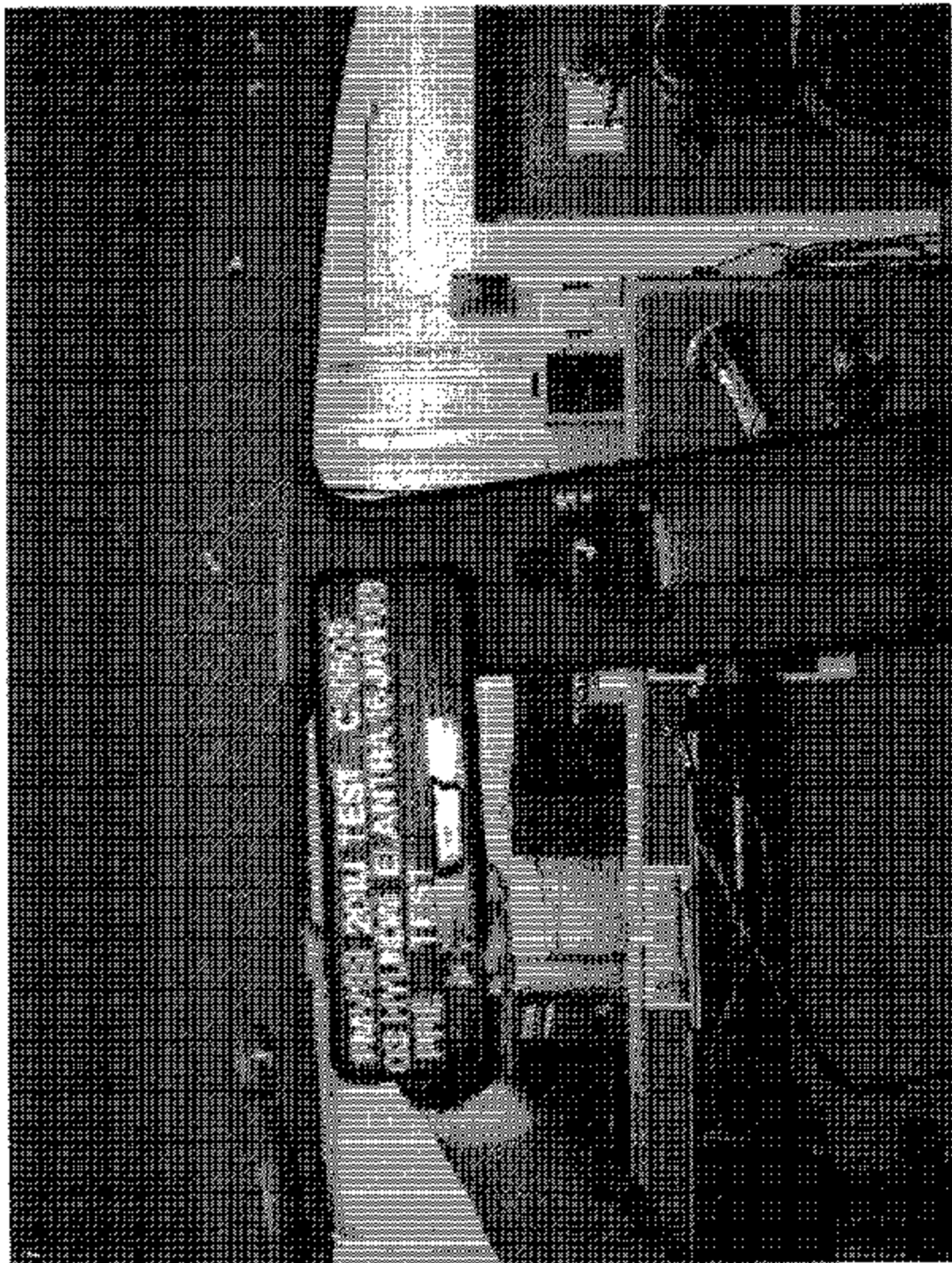


Figure A-10: PRE-TEST DRIVER SIDE B-PILLAR

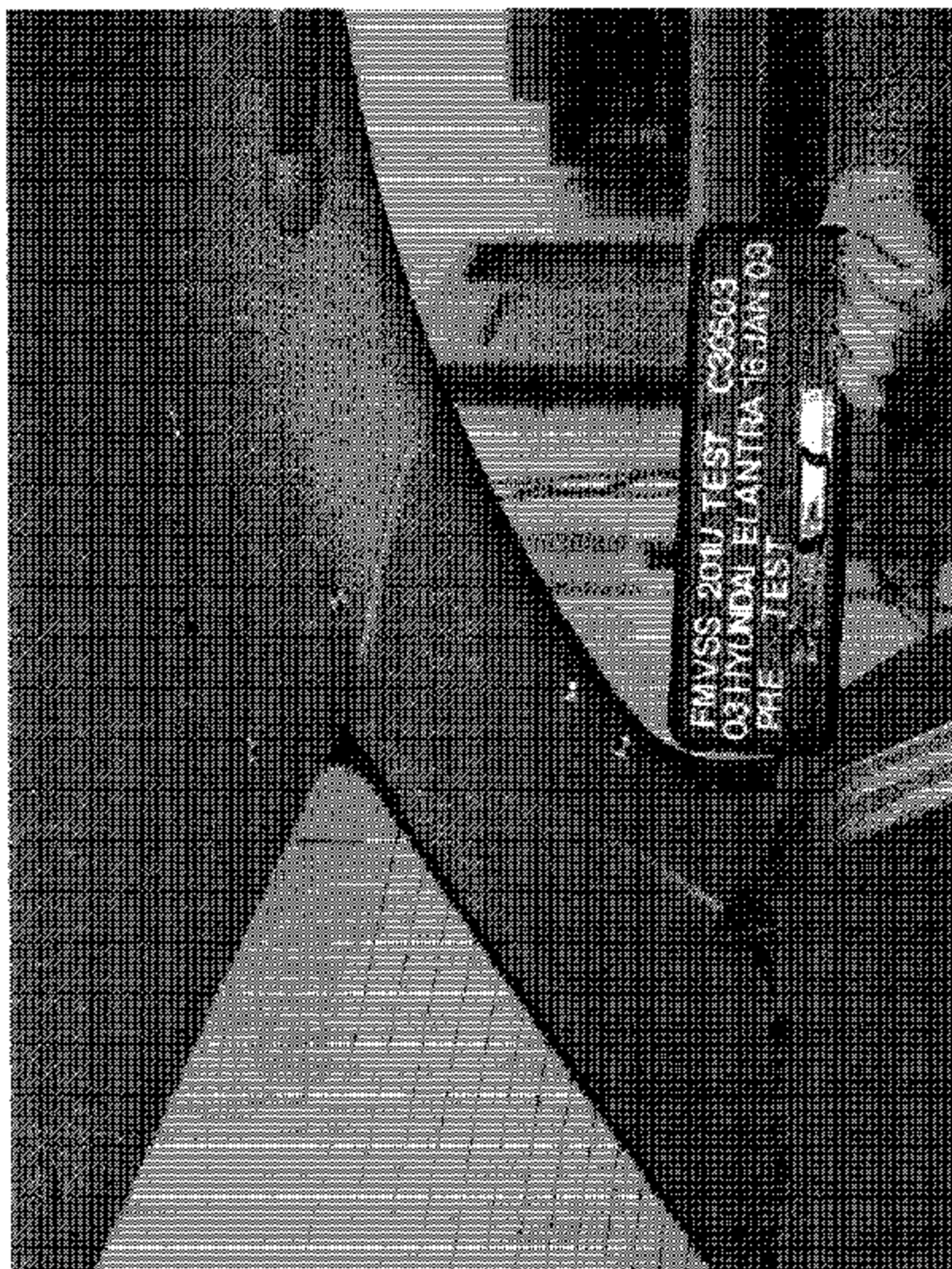


Figure A.11- PRE-TEST DRIVER SIDE REAR PILLAR





Figure A-12. PRE-TEST PASSENGER SIDE A-PILLAR



Figure A-15. PRE-TEST PASSENGER SIDE FRONT HEADER



Figure A-14: PRE-TEST PASSENGER SIDE SIDE RAIL



Figure A-15 PRE TEST PASSENGER SIDE B-PILLAR

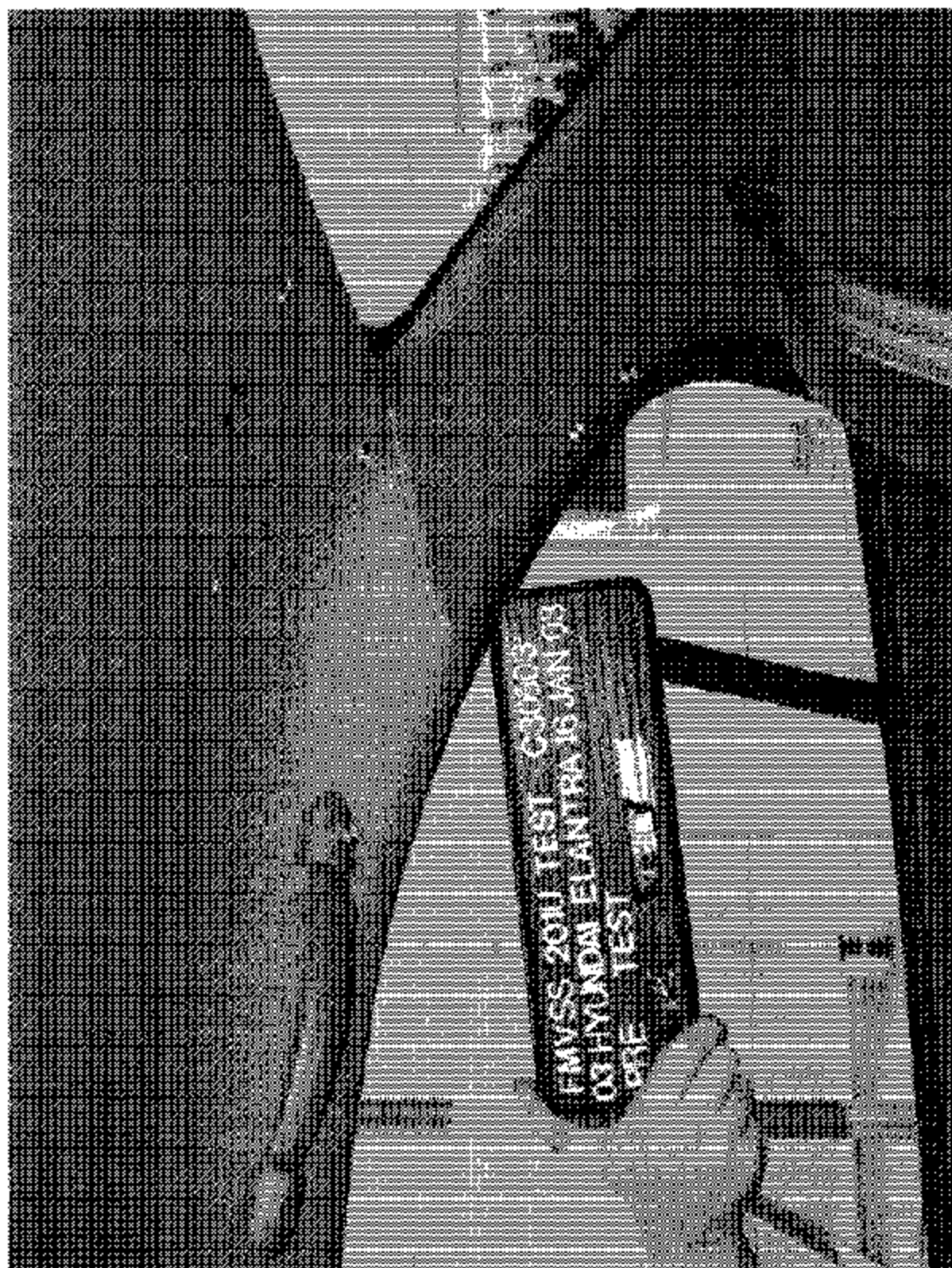


Figure A-16 PRE-TEST PASSENGER SIDE REAR PILLAR

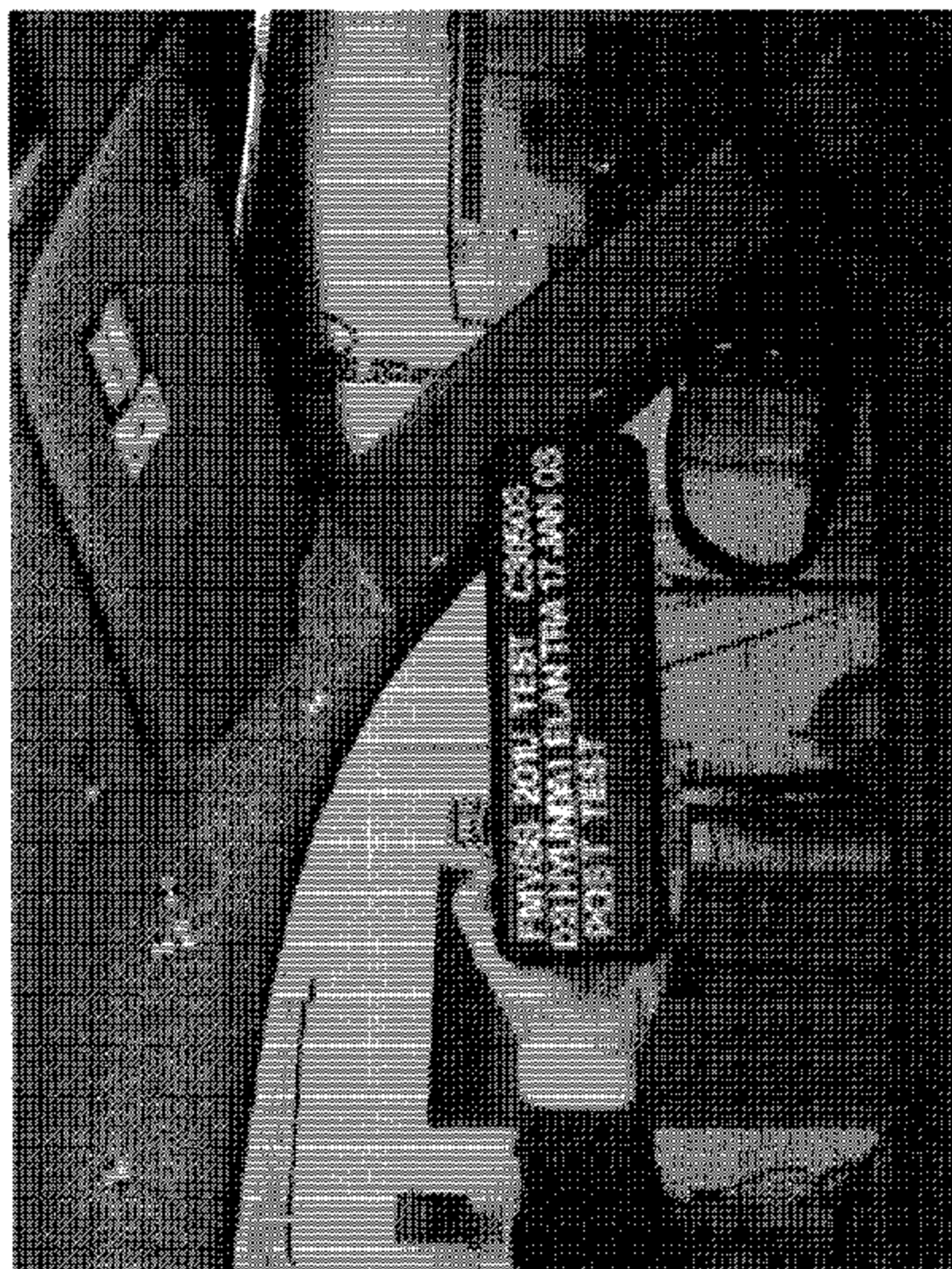


Figure A-17: POST-TEST DRIVER SIDE A-PILLAR

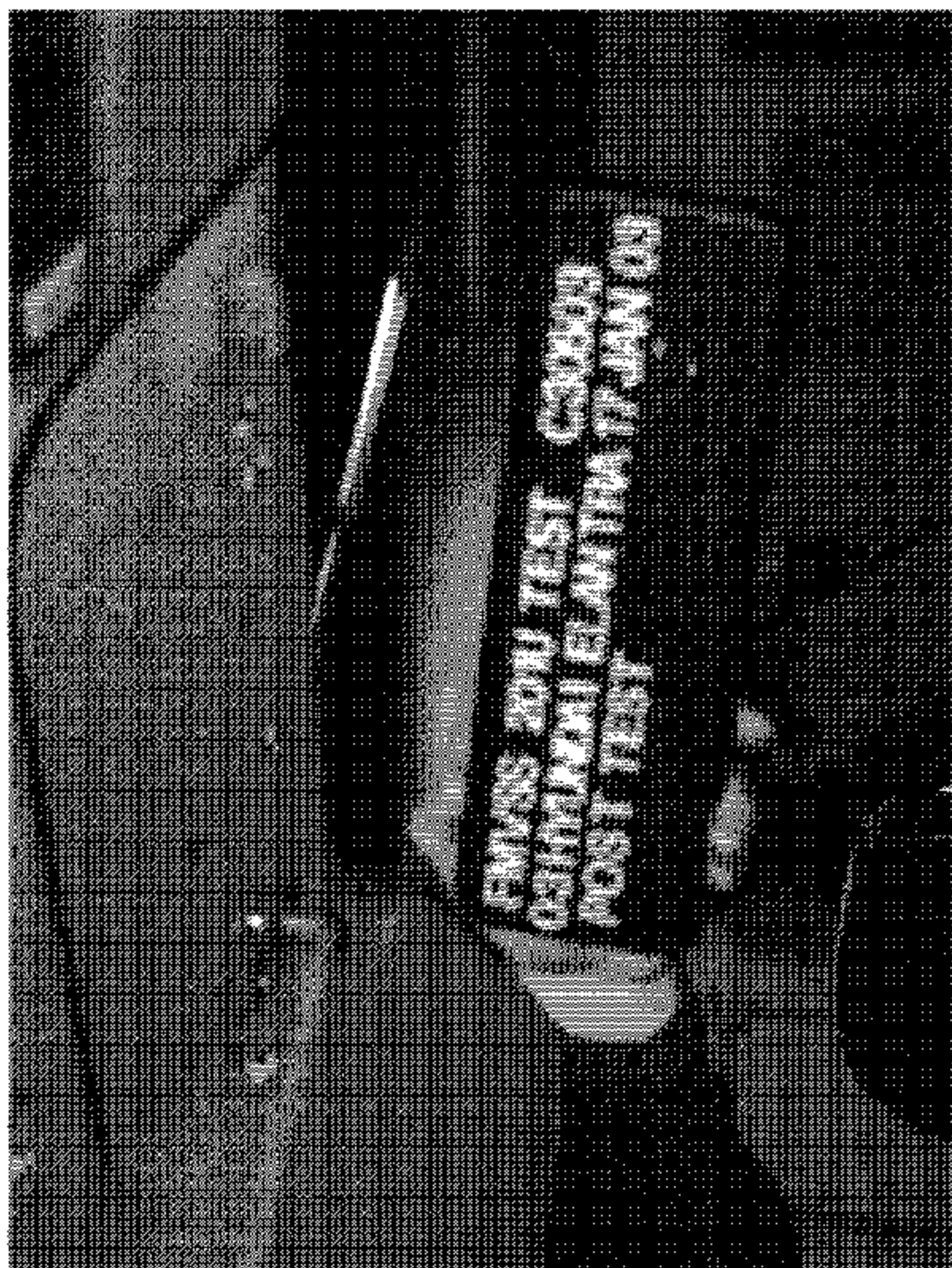


Figure A-18. POST-TEST DRIVER FRONT HEADIER



Figure A-19. POST-TEST DRIVER SIDE RAIL



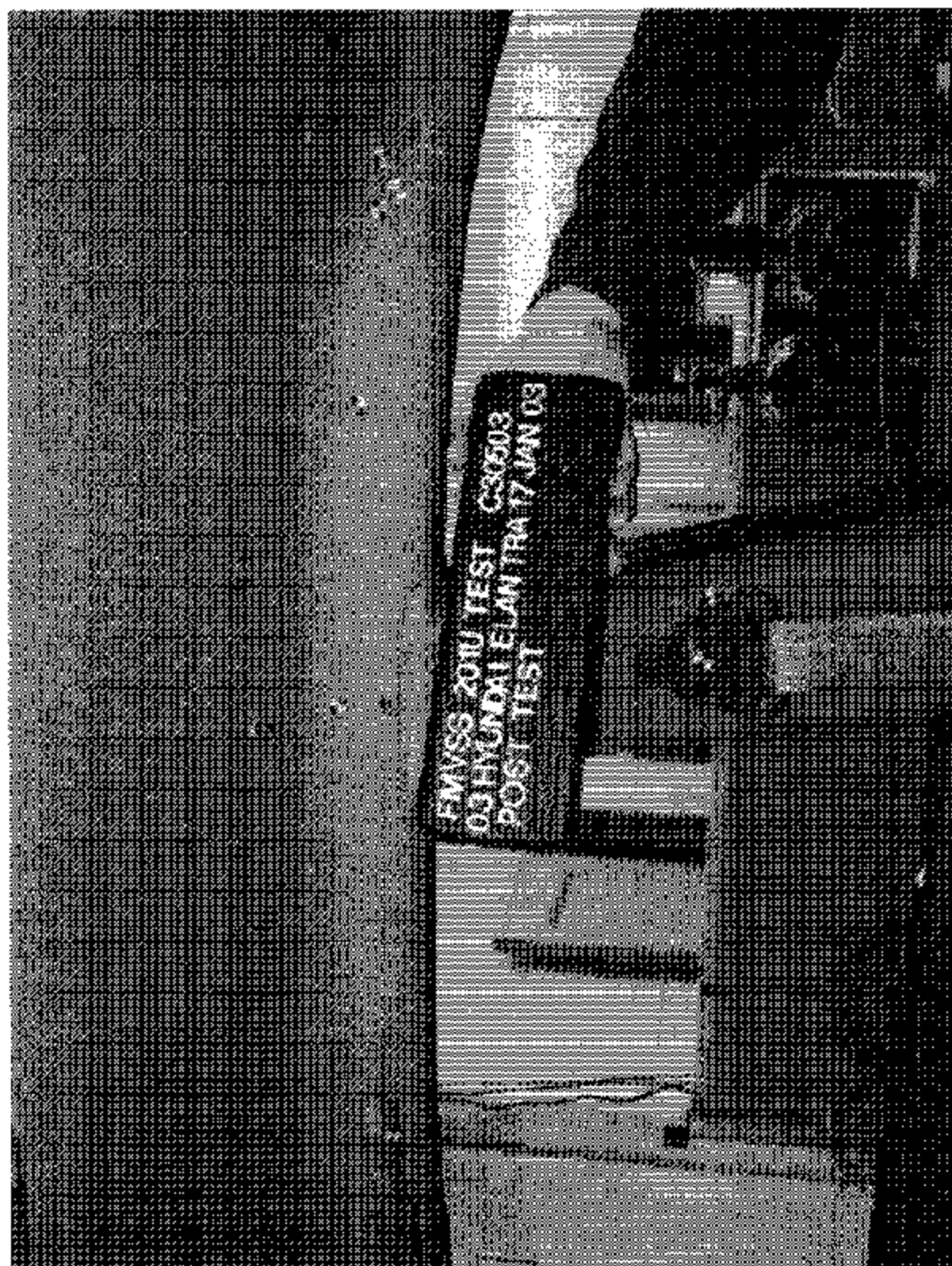


Figure A-20- POST-TEST DRIVER SIDE B-PILLAR



Figure A-21. POST TEST DRIVER SIDE REAR PILLAR

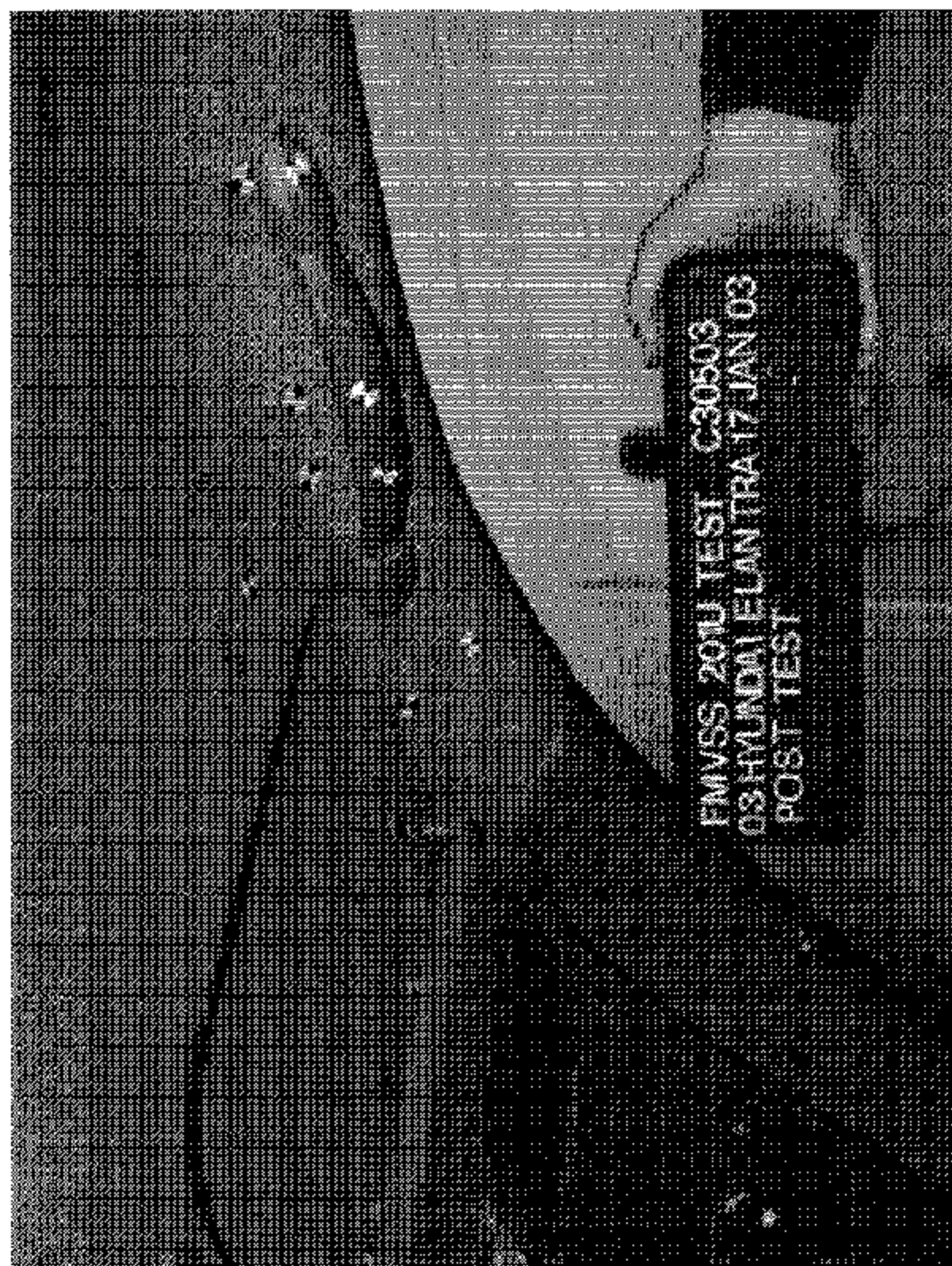


Figure A-22. POST-TEST PASSENGER SIDE A-PILLAR

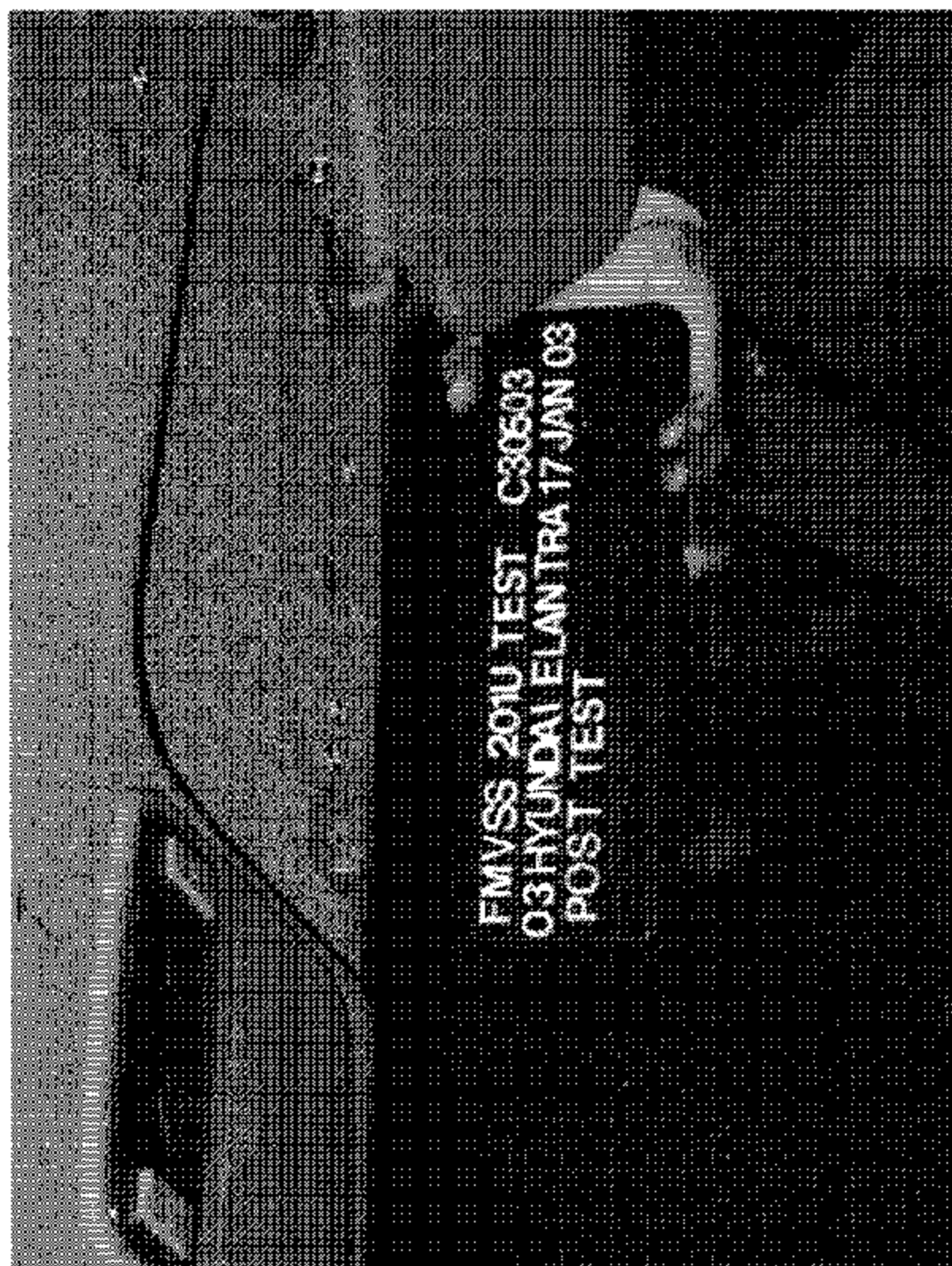


Figure A-23. POST-TEST PASSENGER FRONT HEADER



Figure A-24: POST-TEST PASSENGER SIDE SIDE RAIL



FIGURE A-25. POST-TEST PASSENGER SIDE B-PILLAR

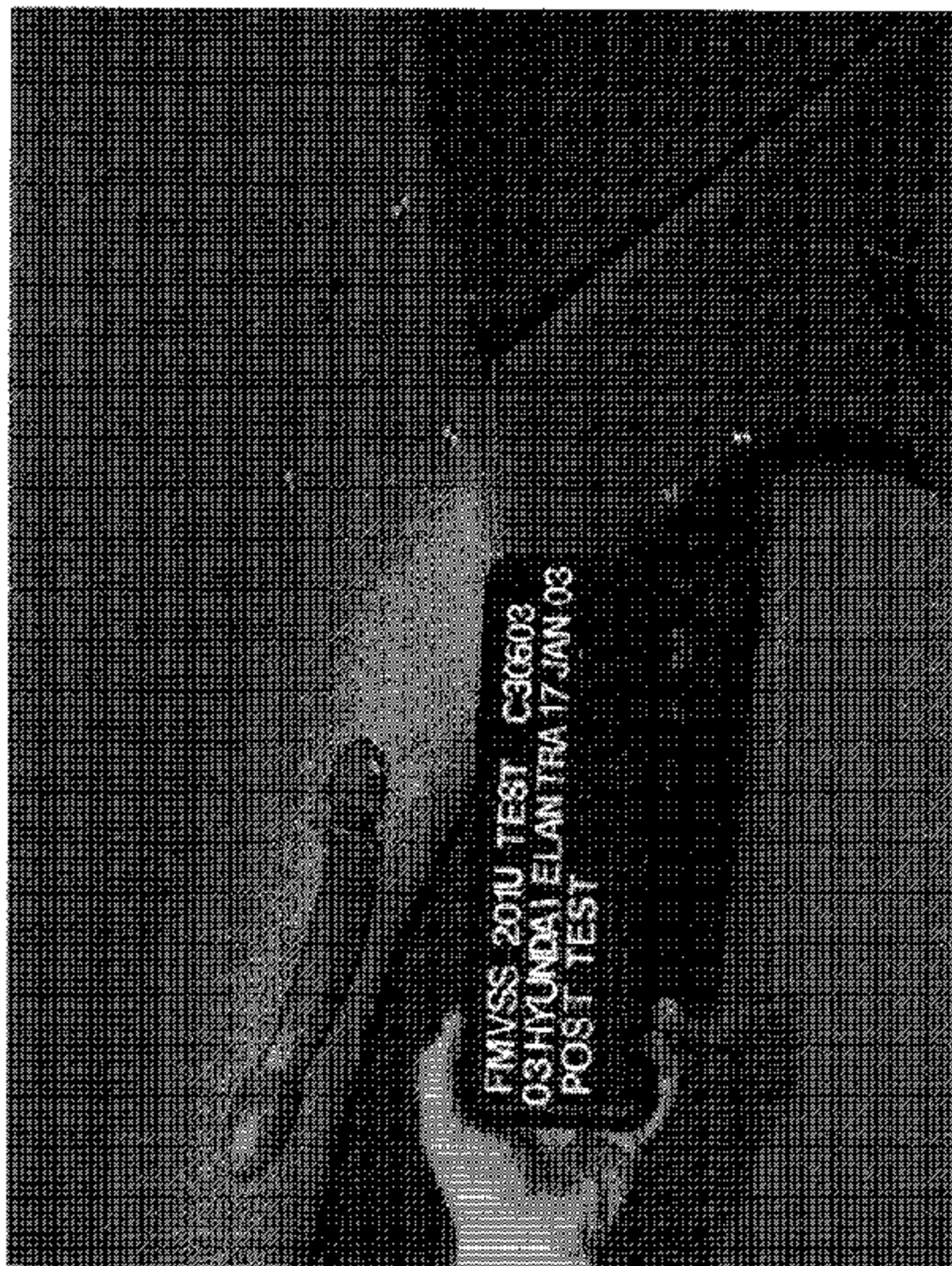


Figure A-26. POST-TEST PASSENGER SIDE REAR PILLAR

## **APPENDIX B**

### **PART 572L PERFORMANCE CALIBRATION IN SUPPORT OF VEHICLE SAFETY COMPLIANCE TESTING FOR OCCUPANT PROTECTION IN INTERIOR IMPACT**

Appendix B contains the results from certification tests performed on the Free Motion Headforms utilized in this test program. The results indicate that the headforms meet all of the performance specifications given in 49 CFR Part 572 Subpart L.

The tests were conducted at the Dummy Certification Test Facility of Veridian Engineering. A summary of the test results are included in this Appendix.



PART 572L  
HEAD DROP PRE-TEST

|                                 |                                   |              |
|---------------------------------|-----------------------------------|--------------|
| MANUFACTURER:                   | FIRST TECHNOLOGIES SAFETY SYSTEMS |              |
| SERIAL NUMBER:                  | 0642                              |              |
| CALIBRATION DATE:               | January 10, 2003                  |              |
| TEST PARAMETER                  | SPECIFICATION                     | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                      | 21           |
| RELATIVE HUMIDITY               | 10% to 70%                        | 21           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                  | 243.6        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                     | 5.3          |
| IS ACCELERATION CURVE UNIMODAL? | YES                               | YES          |

HEAD ACCELEROMETER CALIBRATION INFORMATION

| I.D. NUMBER      | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J24876        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J33030        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J31009        | 9/02                     | 3/03                     |

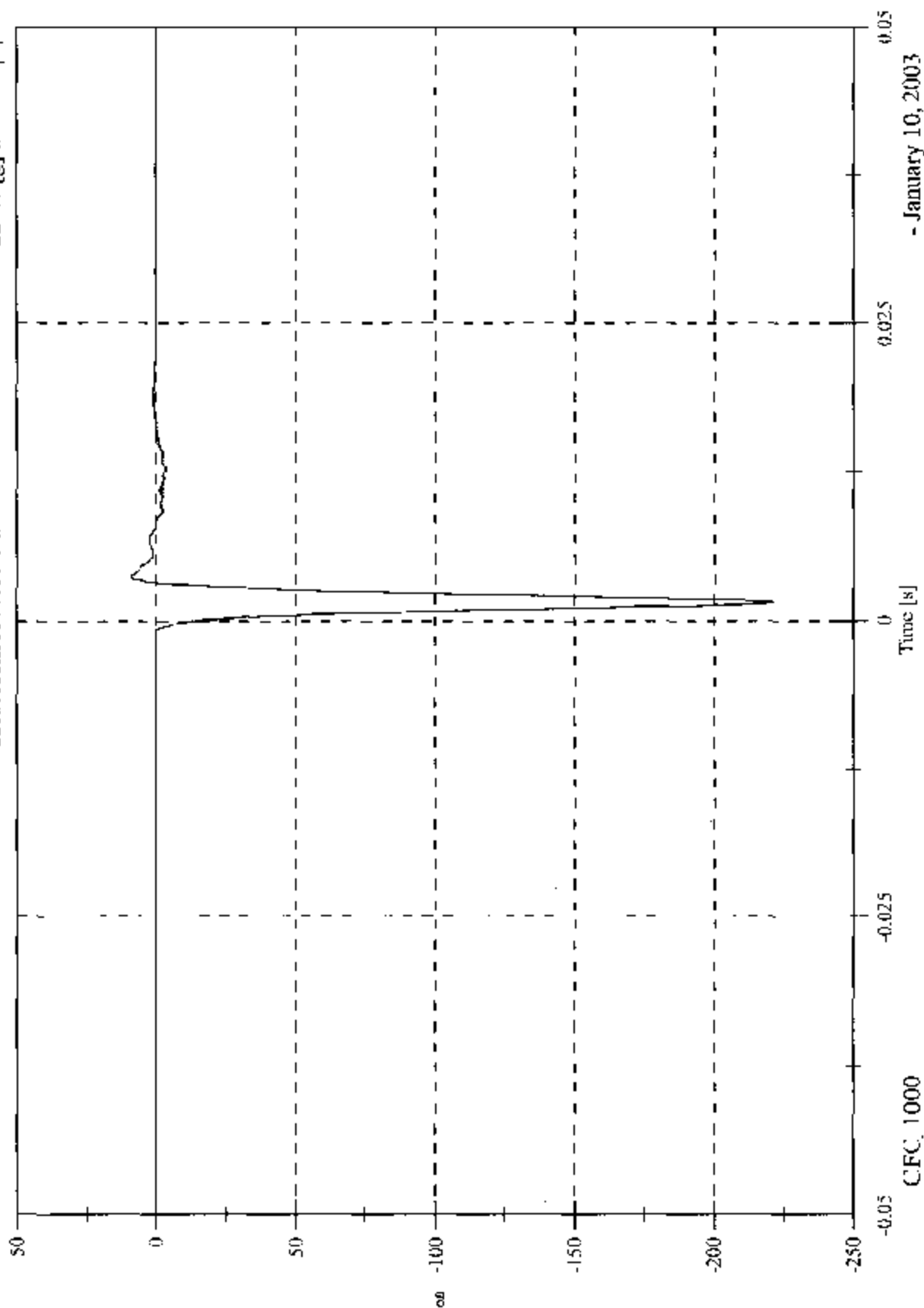
REMARKS:

FMVSS 201U - Head Form Calibration Drops

Max: 8.8 [g] at 0.004 [s]

Min: -221.6 [g] at 0.002 [s]

Headform X Acceleration

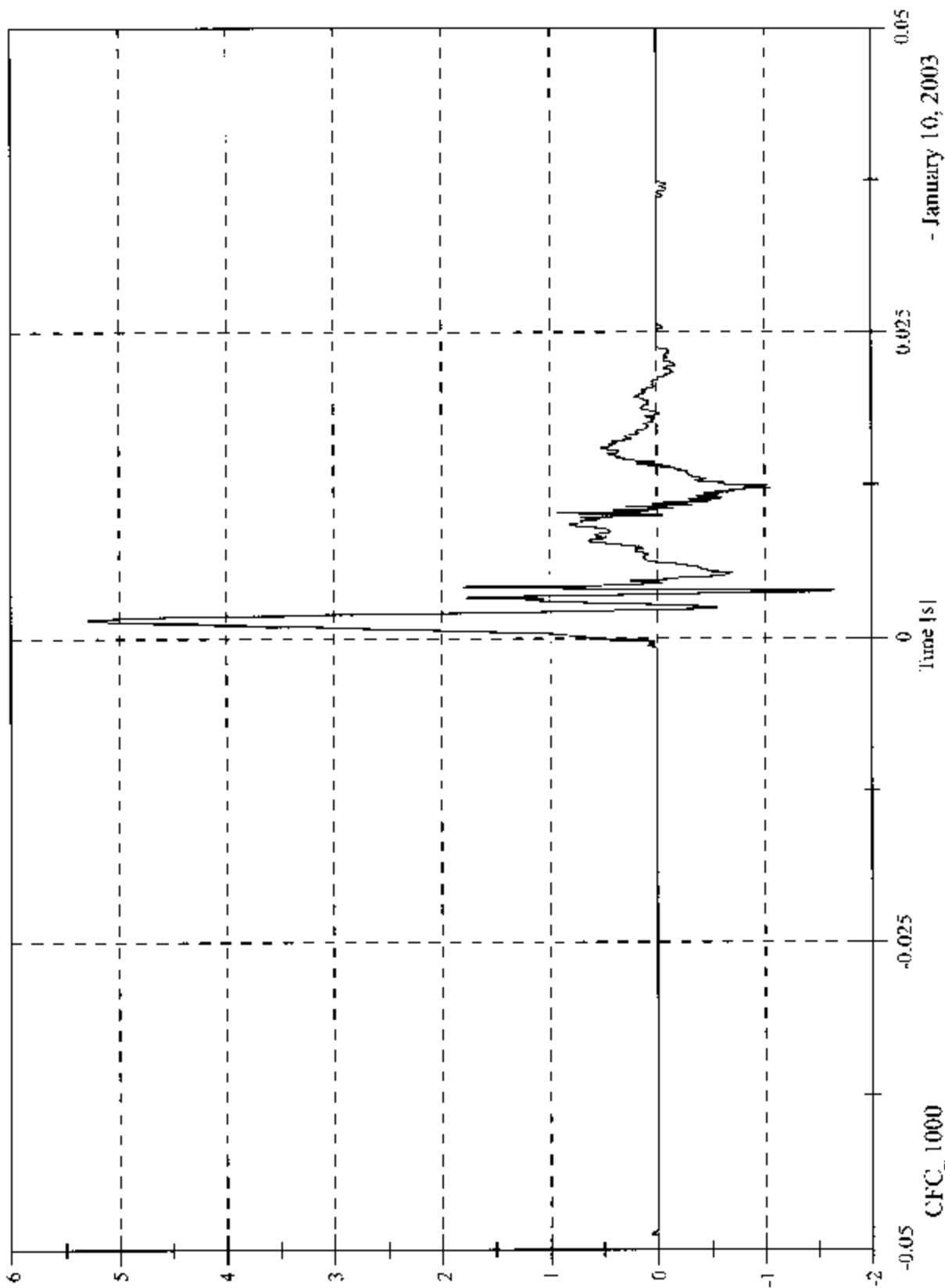


- January 10, 2003

FMVSS 201U - Head Form Calibration Drops

Headform Y Acceleration

Max: 5.3 [g] at 0.001 [s]  
Min: -1.6 [g] at 0.004 [s]

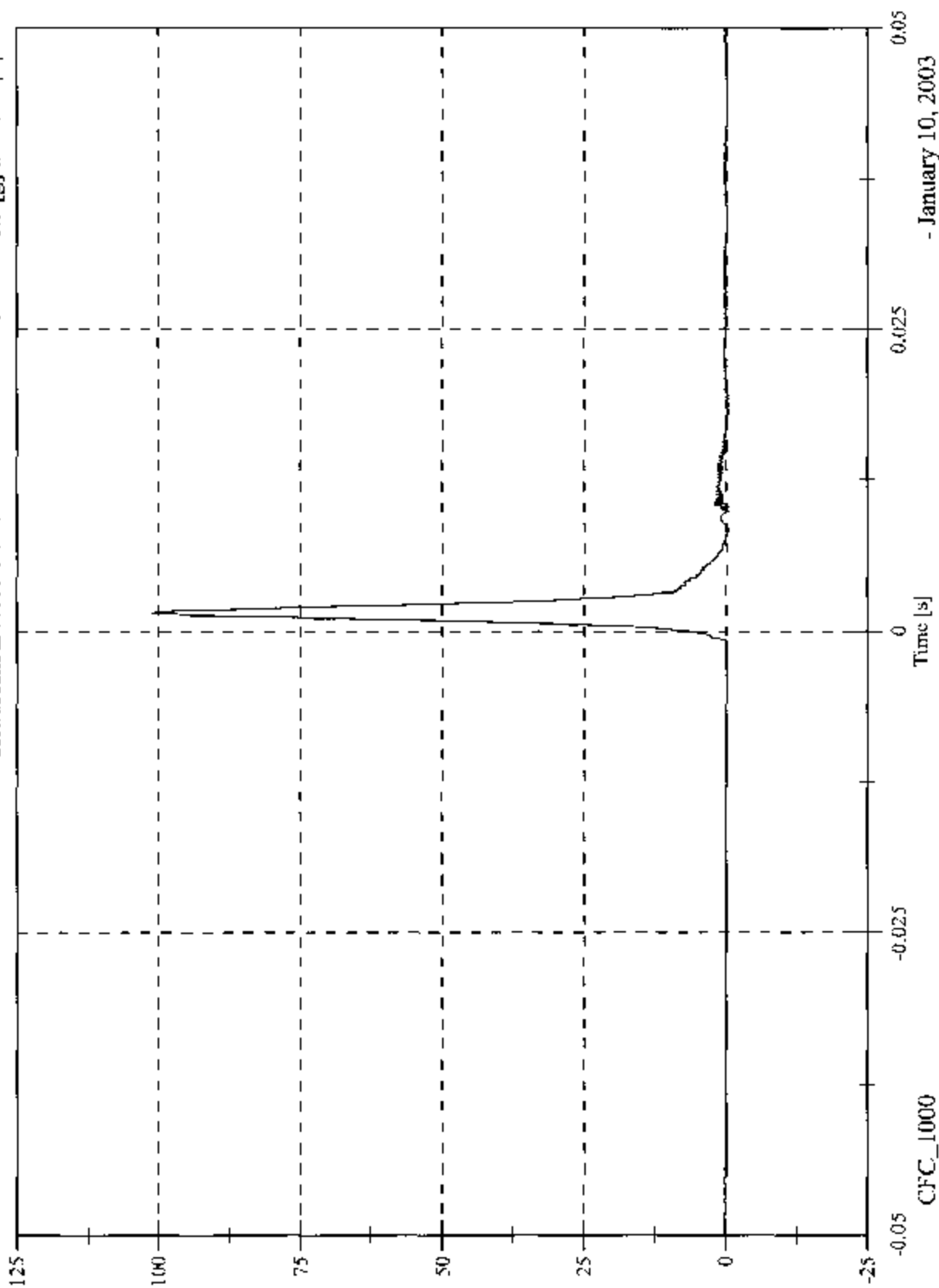


- January 10, 2003

FMVSS 201U - Head Form Calibration Drops

Max: 101.0 [g] at 0.002 [s]  
Min: -0.5 [g] at 0.010 [s]

Headform Z Acceleration

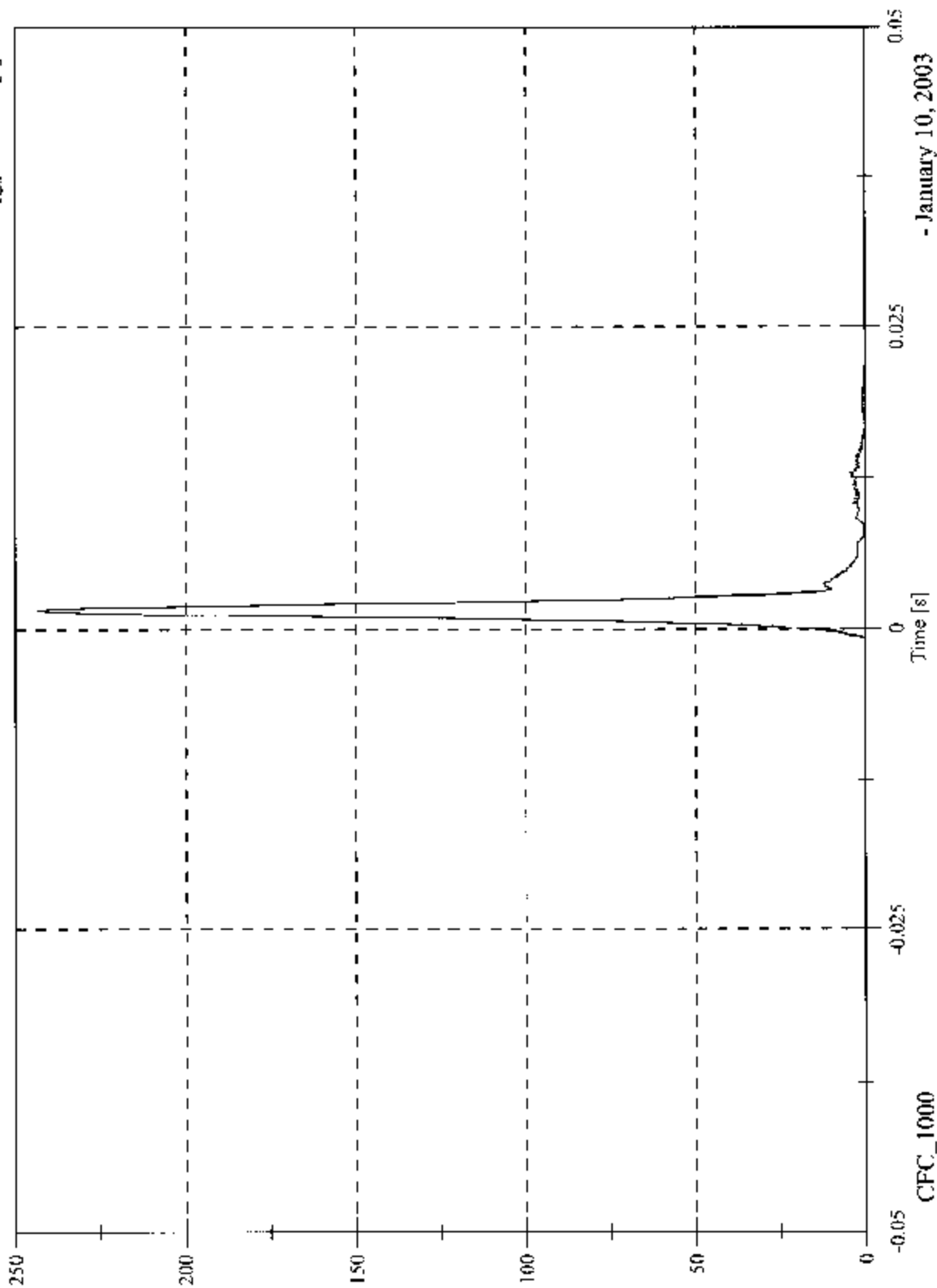


- January 10, 2003

FMVSS 201U - Head Form Calibration Drops

Headform Resultant

Max: 243.6 [g] at 0.002 [s]  
Min: 0.0 [g] at 0.040 [s]



- January 10, 2003

PART 572L  
HEAD DROP PRE TEST

|                                 |                                   |              |
|---------------------------------|-----------------------------------|--------------|
| MANUFACTURER:                   | FIRST TECHNOLOGIES SAFETY SYSTEMS |              |
| SERIAL NUMBER:                  | 805                               |              |
| CALIBRATION DATE:               | December 23, 2002                 |              |
| TEST PARAMETER                  | SPECIFICATION                     | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                      | 21           |
| RELATIVE HUMIDITY               | 10% to 70%                        | 21           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                  | 260.0        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                     | 8.5          |
| IS ACCELERATION CURVE UNIMODAL? | YES                               | YES          |

HEAD ACCELEROMETER CALIBRATION INFORMATION

| I.D. NUMBER      | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J38127        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J37980        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J37854        | 9/02                     | 3/03                     |

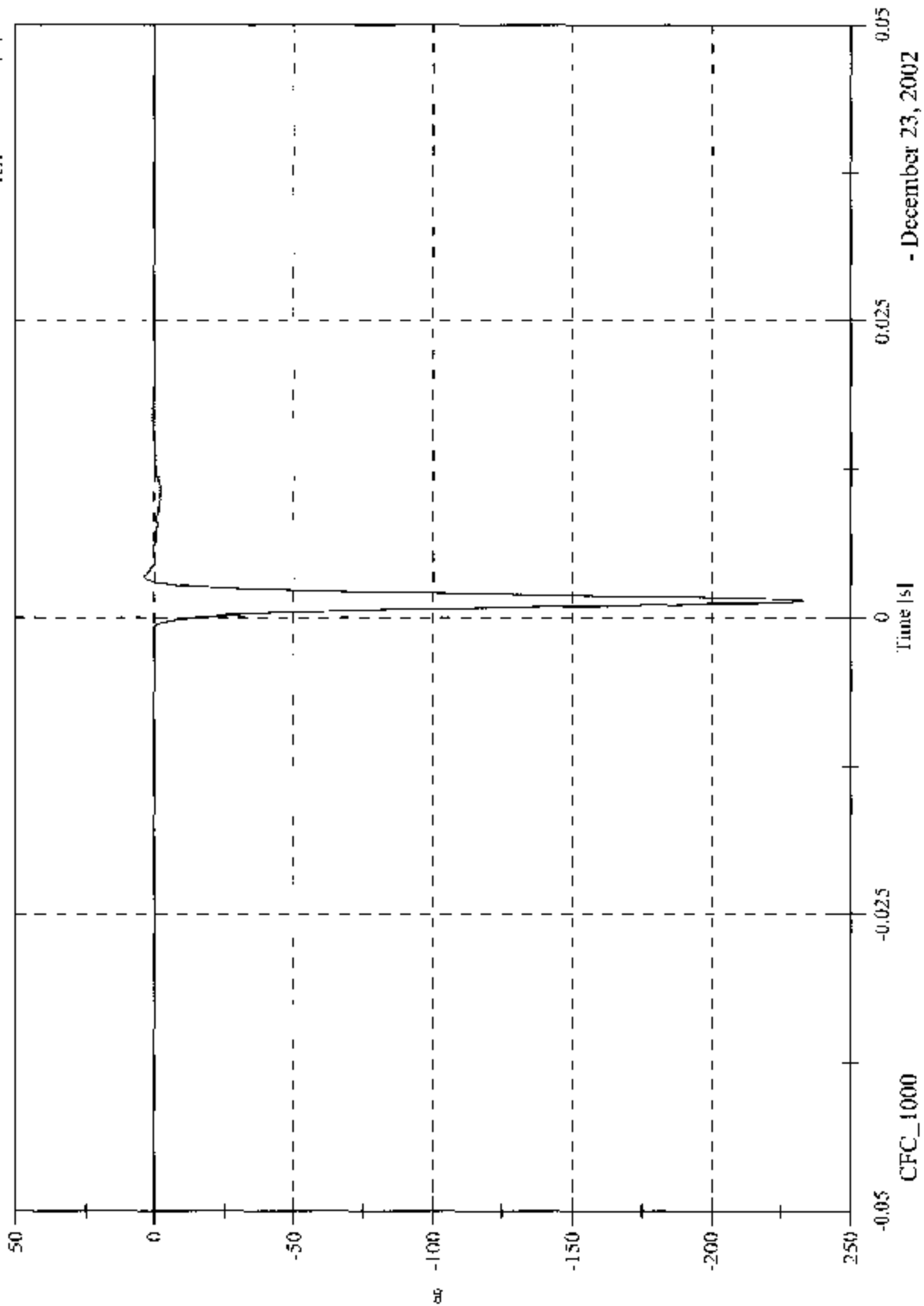
REMARKS:

FMVSS 201U - Head Form Calibration Drops

Max: 3.8 [g] at 0.004 [s]

Min: -232.7 [g] at 0.001 [s]

Headform X Acceleration

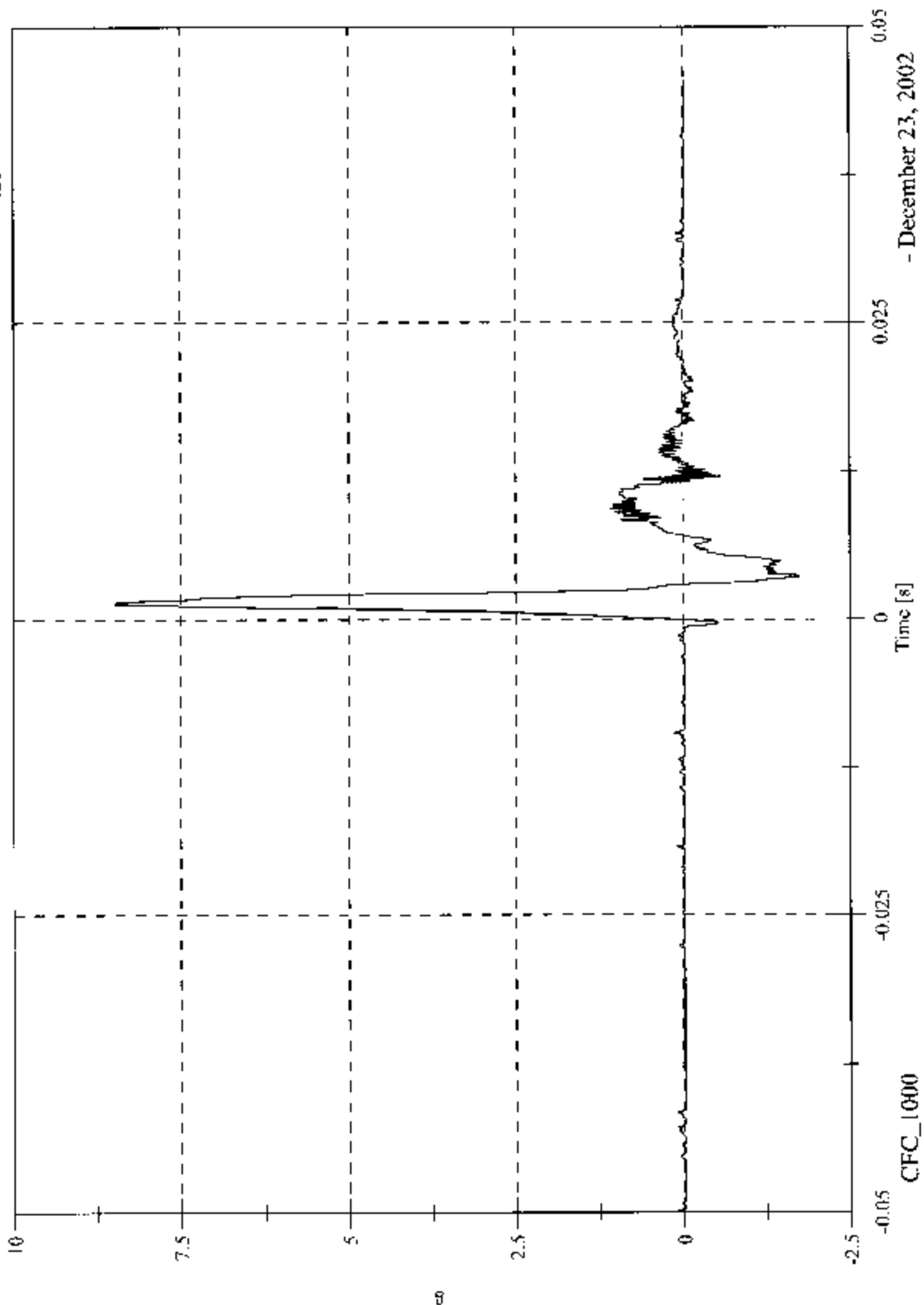


- December 23, 2002

# FMVSS 201U - Head Form Calibration Drops

Max: 8.5 [g] at 0.001 [s]  
Min: -1.7 [g] at 0.004 [s]

Headform Y Acceleration

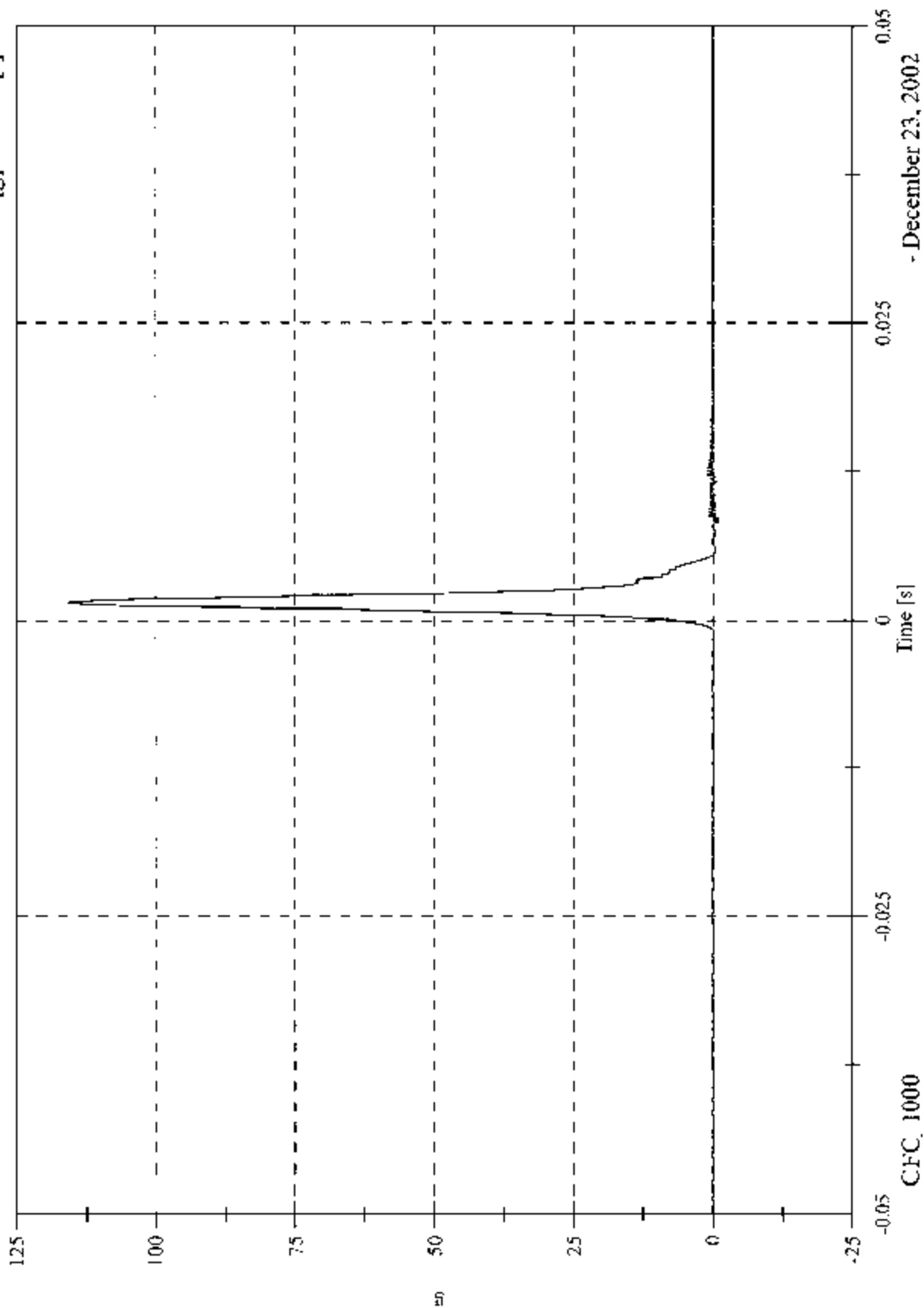




FMVSS 201U - Head Form Calibration Drops

Headform Z Acceleration

Max: 115.7 [g] at 0.001 [s]  
Min: -0.9 [g] at 0.008 [s]

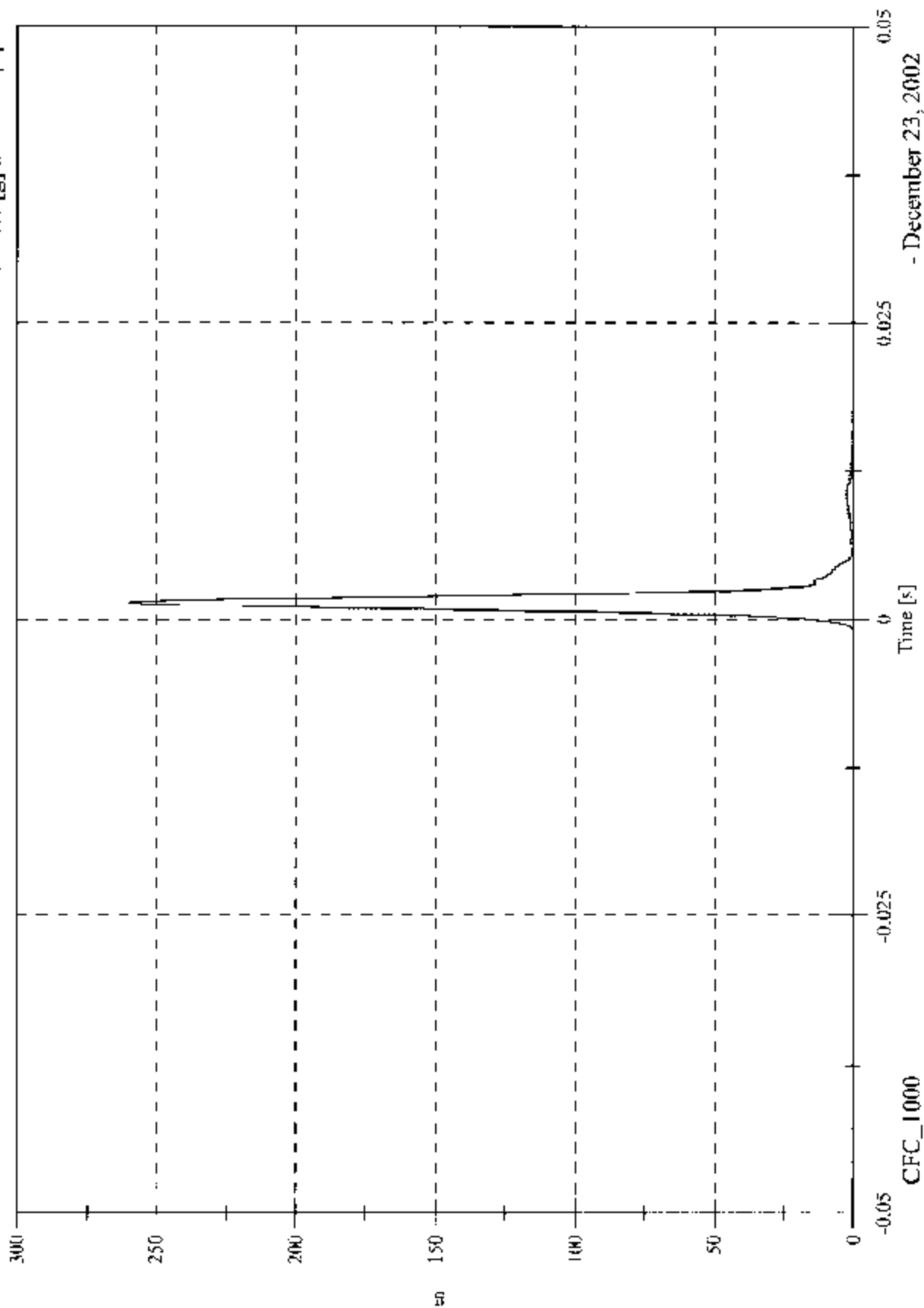


- December 23, 2002

# FMVSS 201U - Head Form Calibration Drops

Max: 260.0 [g] at 0.001 [s]  
Min: 0.0 [g] at -0.025 [s]

Headform Resultant



CFC\_1000

-0.025

0

0.025

0.05

- December 23, 2002

**PART 572L  
HEAD DROP PRE TEST**

|                                 |                                         |              |
|---------------------------------|-----------------------------------------|--------------|
| MANUFACTURER:                   | APPLIED SAFETY TECHNOLOGIES CORPORATION |              |
| SERIAL NUMBER:                  | 0062                                    |              |
| CALIBRATION DATE:               | January 10, 2003                        |              |
| TEST PARAMETER                  | SPECIFICATION                           | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                            | 21           |
| RELATIVE HUMIDITY               | 10% to 70%                              | 21           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                        | 246.0        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                           | 7.3          |
| IS ACCELERATION CURVE UNIMODAL? | YES                                     | YES          |

**HEAD ACCELEROMETER CALIBRATION INFORMATION**

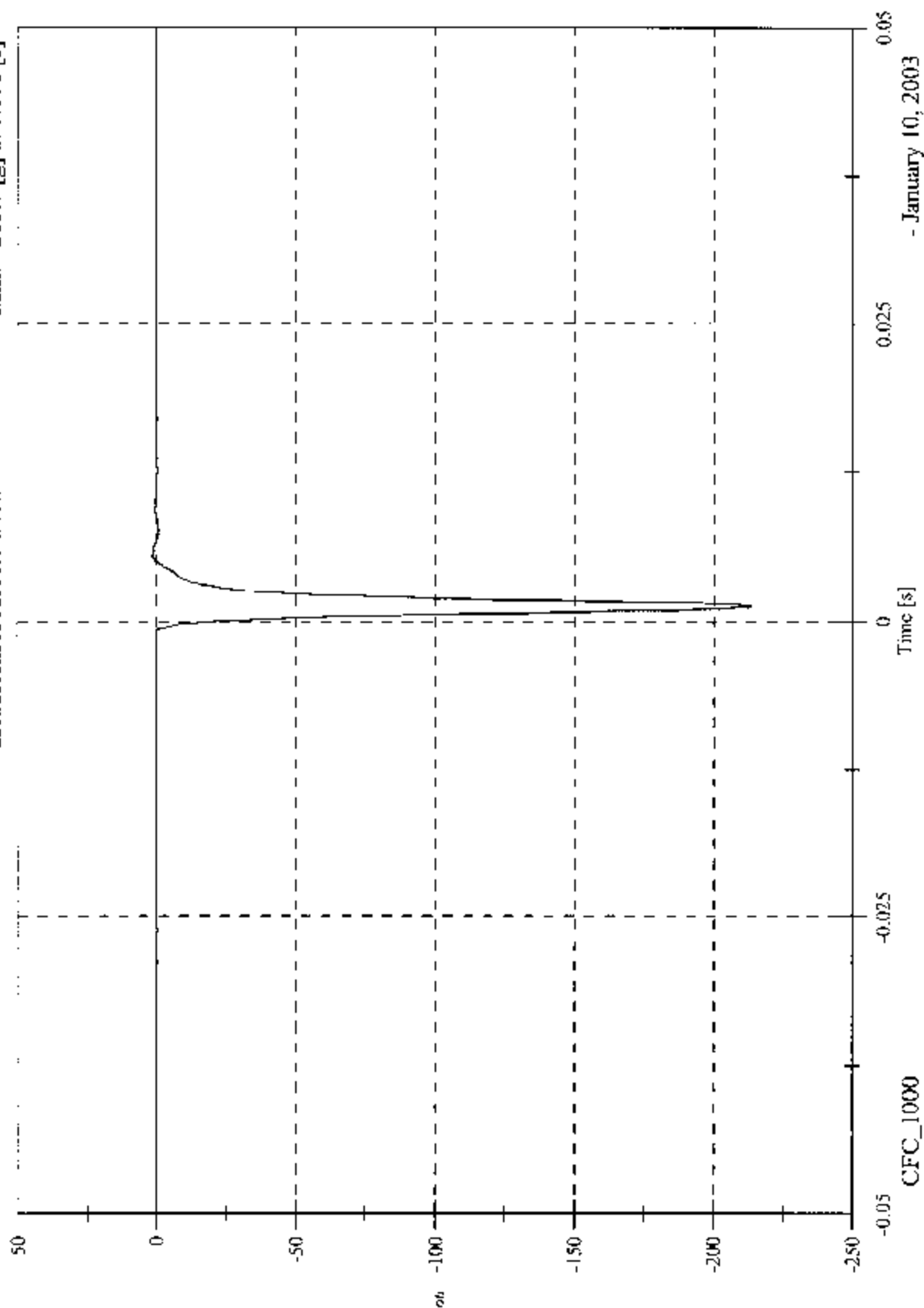
| I.D. NUMBER      | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J33127        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J33019        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J32782        | 9/02                     | 3/03                     |

REMARKS:

FMVSS 201U - Head Form Calibration Drops

Max: 1.5 [g] at 0.005 [s]  
Min: -213.7 [g] at 0.001 [s]

Headform X Acceleration

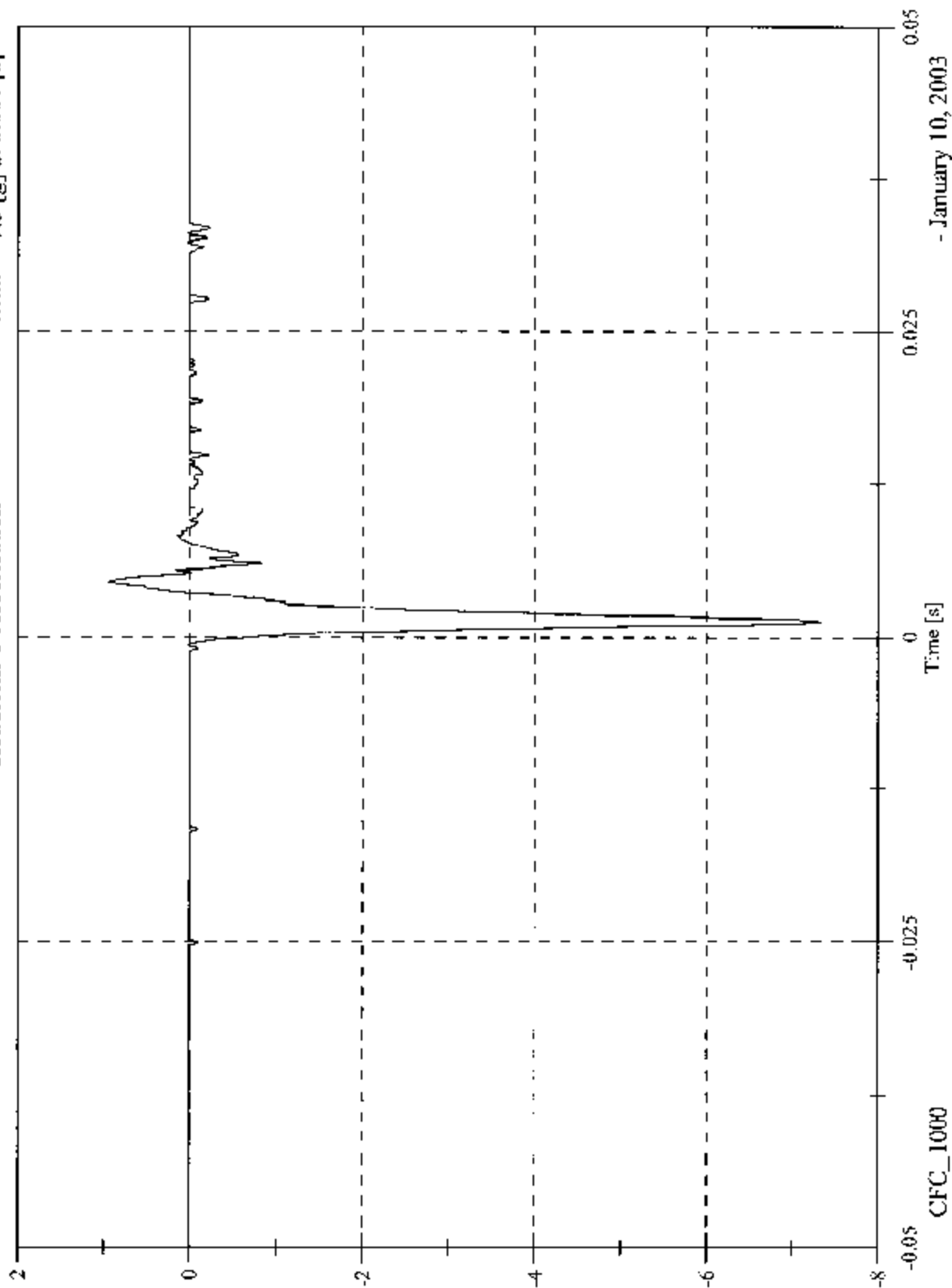


- January 10, 2003

FMVSS 201U - Head Form Calibration Drops

Max: 1.0 [g] at 0.004 [s]  
Min: -7.3 [g] at 0.001 [s]

Headform Y Acceleration

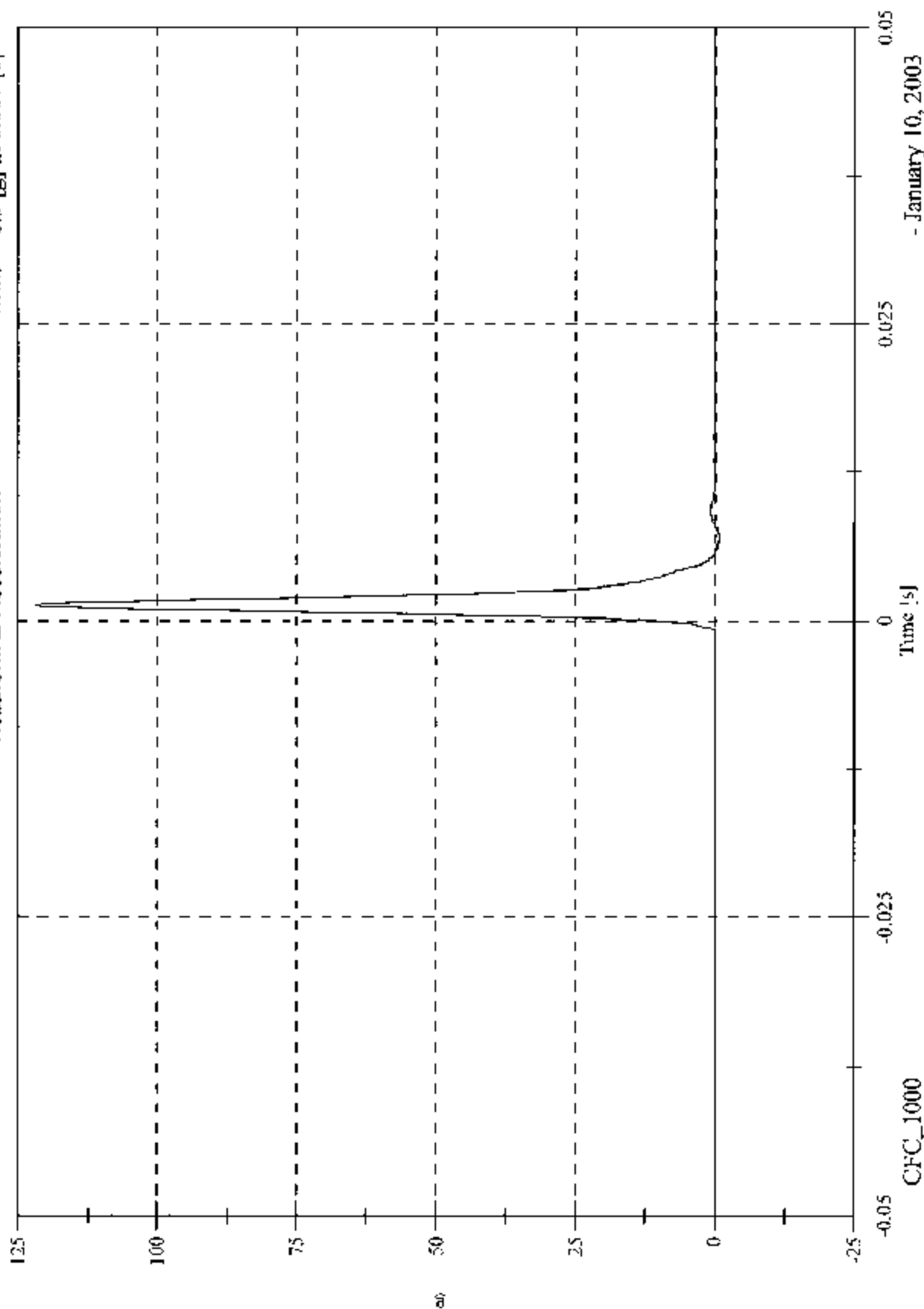


- January 10, 2003

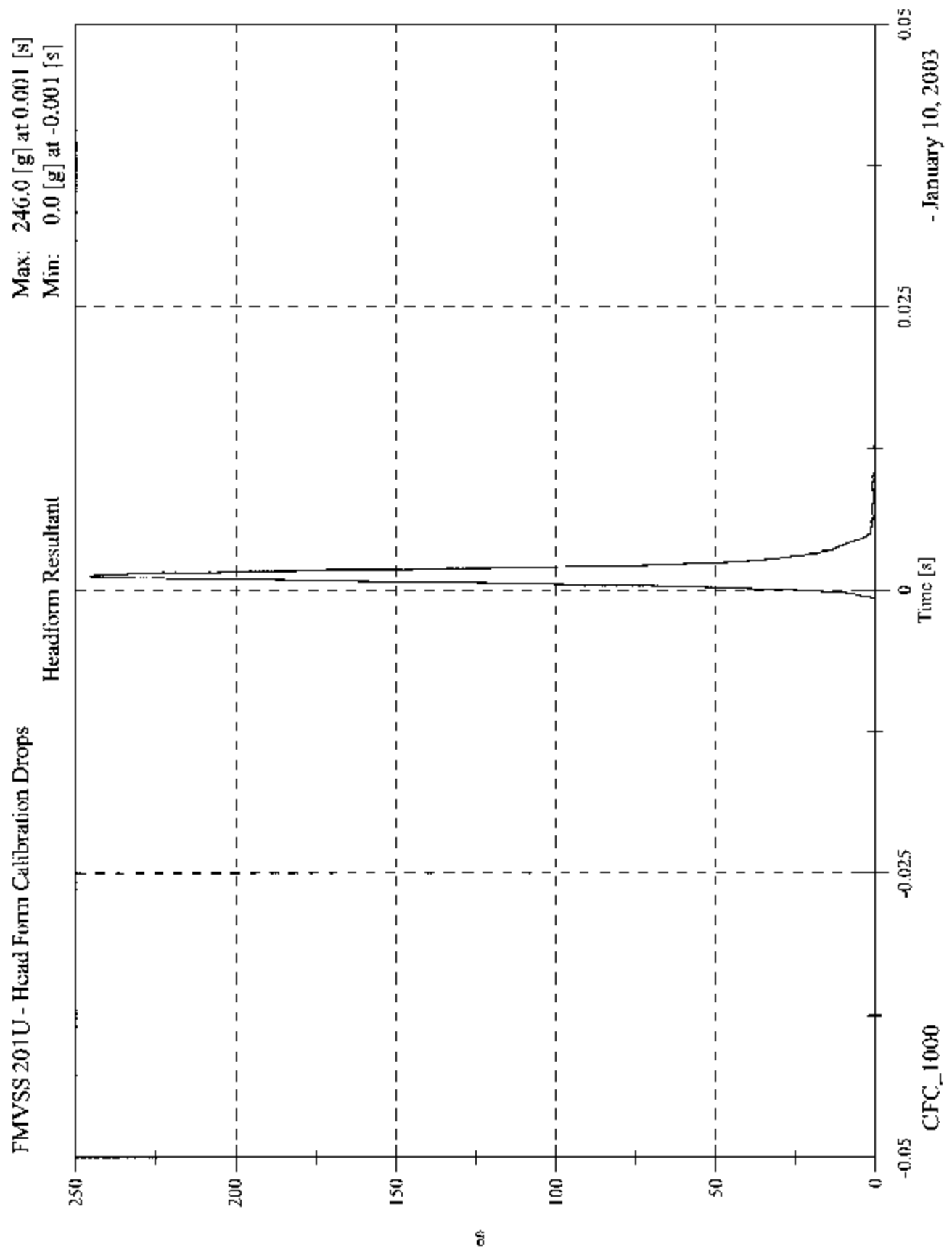
# FMVSS 201U - Ilead Form Calibration Drops

Max: 121.7 [g] at 0.001 [s]  
Min: -0.9 [g] at 0.007 [s]

Ileadform Z Acceleration



- January 10, 2003



PART 572L  
HEAD DROP PRE-TEST

|                                 |                                         |              |
|---------------------------------|-----------------------------------------|--------------|
| MANUFACTURER:                   | APPLIED SAFETY TECHNOLOGIES CORPORATION |              |
| SERIAL NUMBER:                  | 0355                                    |              |
| CALIBRATION DATE:               | January 10, 2003                        |              |
| TEST PARAMETER                  | SPECIFICATION                           | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                            | 21           |
| RELATIVE HUMIDITY               | 10% to 70%                              | 21           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                        | 233.4        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                           | 1.2          |
| IS ACCELERATION CURVE UNIMODAL? | YES                                     | YES          |

HEAD ACCELEROMETER CALIBRATION INFORMATION

| ID. NUMBER       | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J28671        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J32779        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J25854        | 9/02                     | 3/03                     |

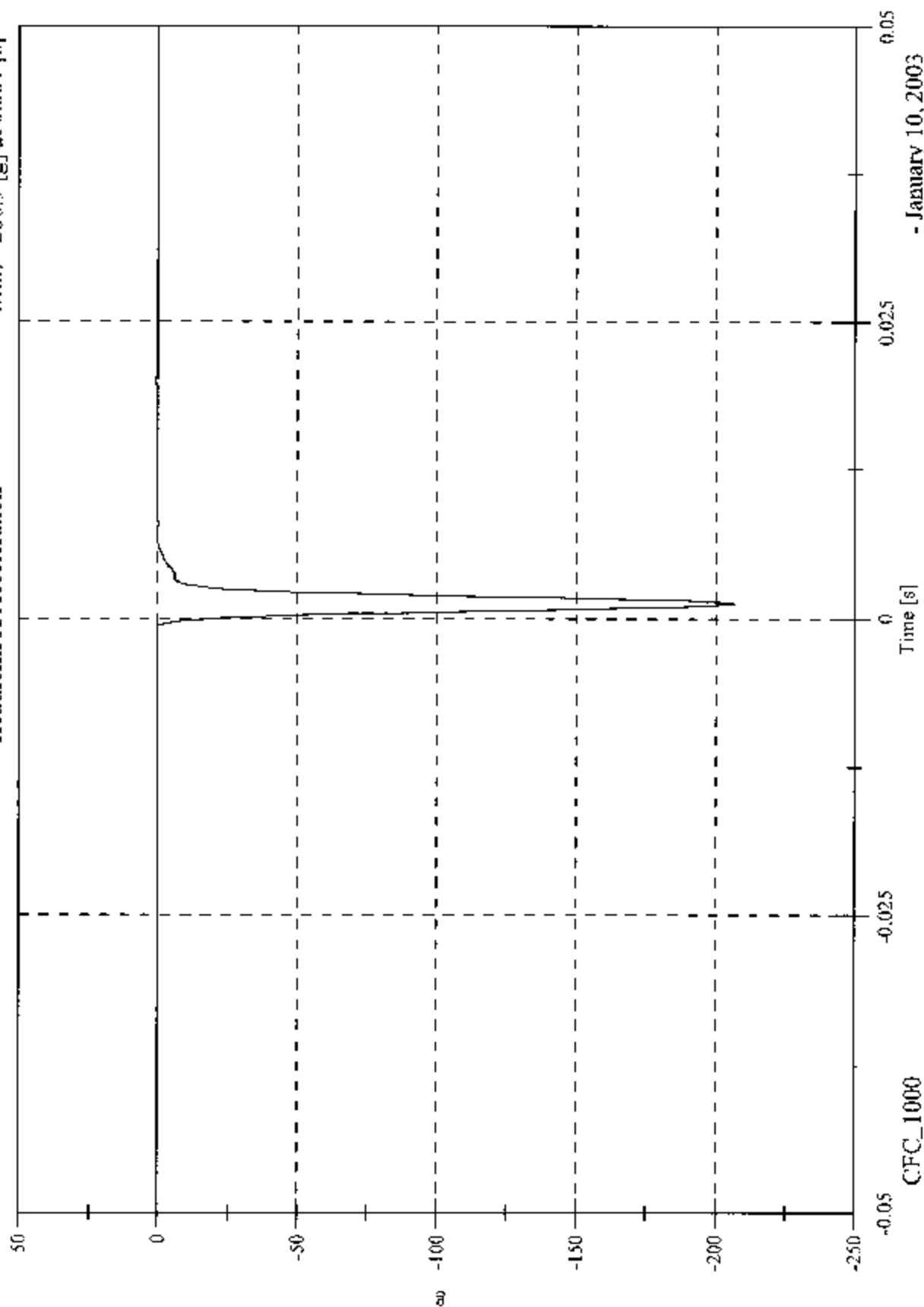
REMARKS:



FMVSS 201U - Ilead Form Calibration Drops

Max: 1.0 [g] at 0.020 [s]  
Min: -206.9 [g] at 0.001 [s]

Headform X Acceleration

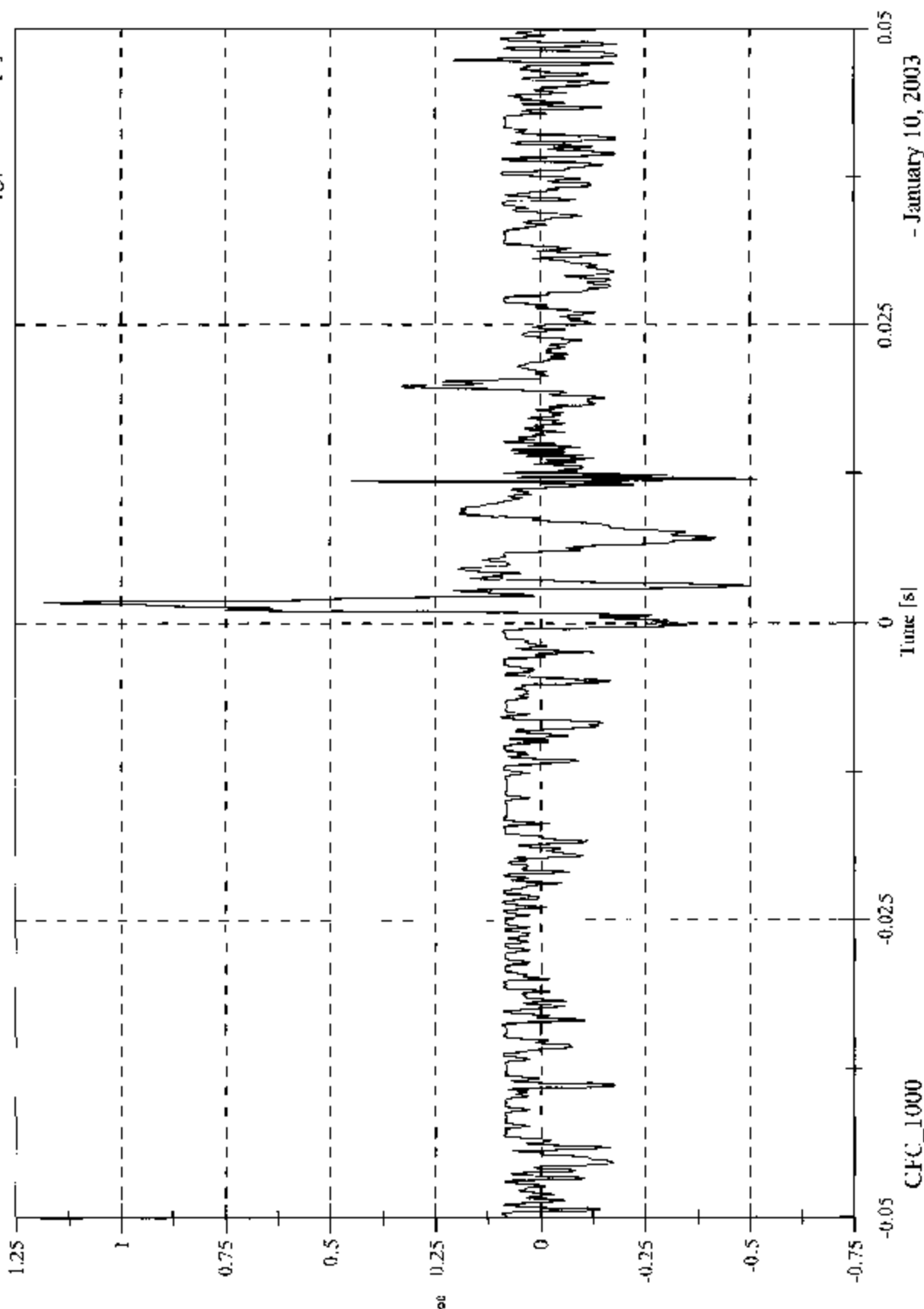


- January 10, 2003

# FMVSS 2010 - II Head Form Calibration Drops

Max: 1.2 [g] at 0.002 [s]  
 Min: -0.5 [g] at 0.012 [s]

Headform Y Acceleration

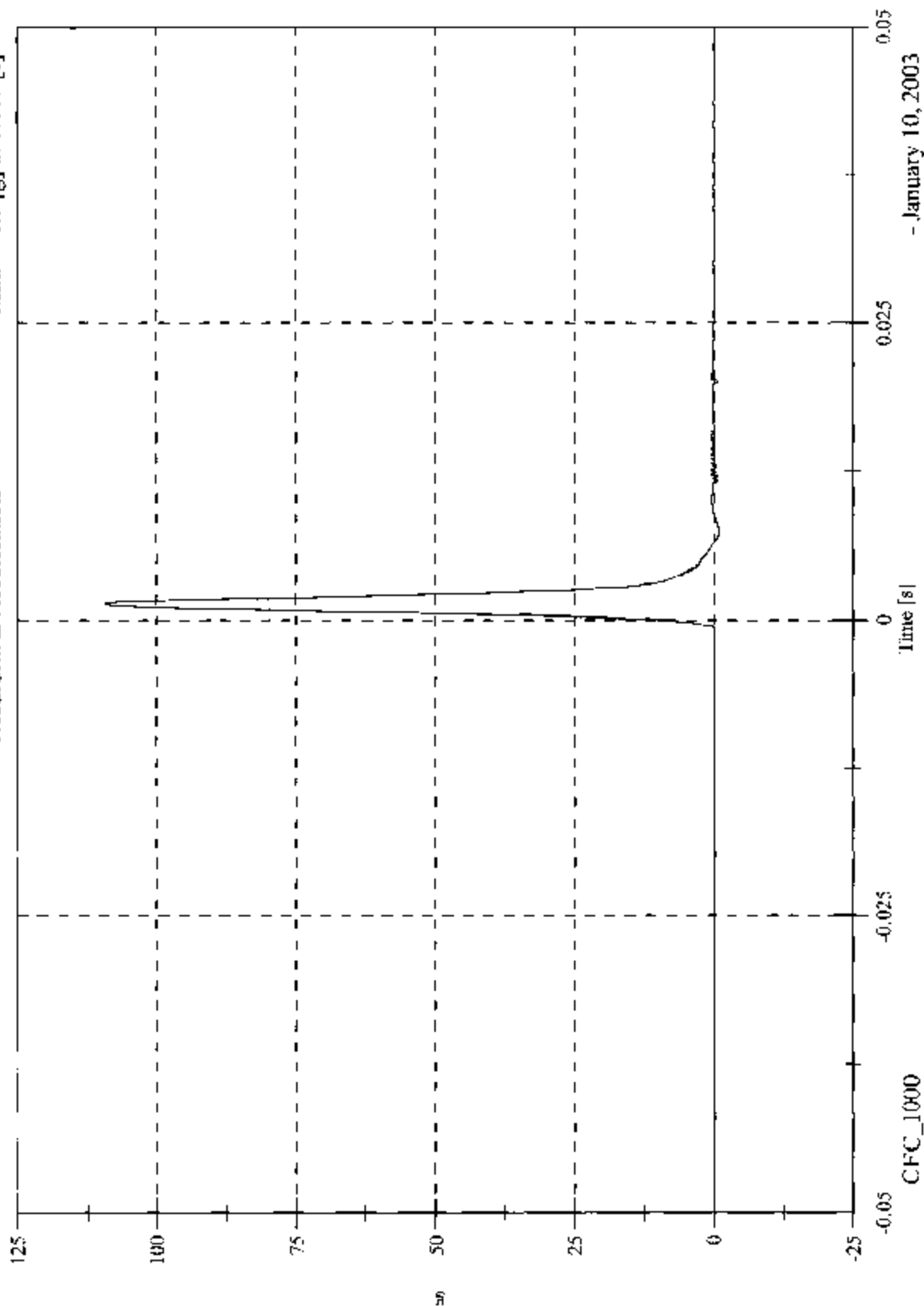


- January 10, 2003

FMVSS 201U - Head Form Calibration Drops

Max: 109.2 [g] at 0.001 [s]  
Min: -0.9 [g] at 0.007 [s]

Headform Z Acceleration

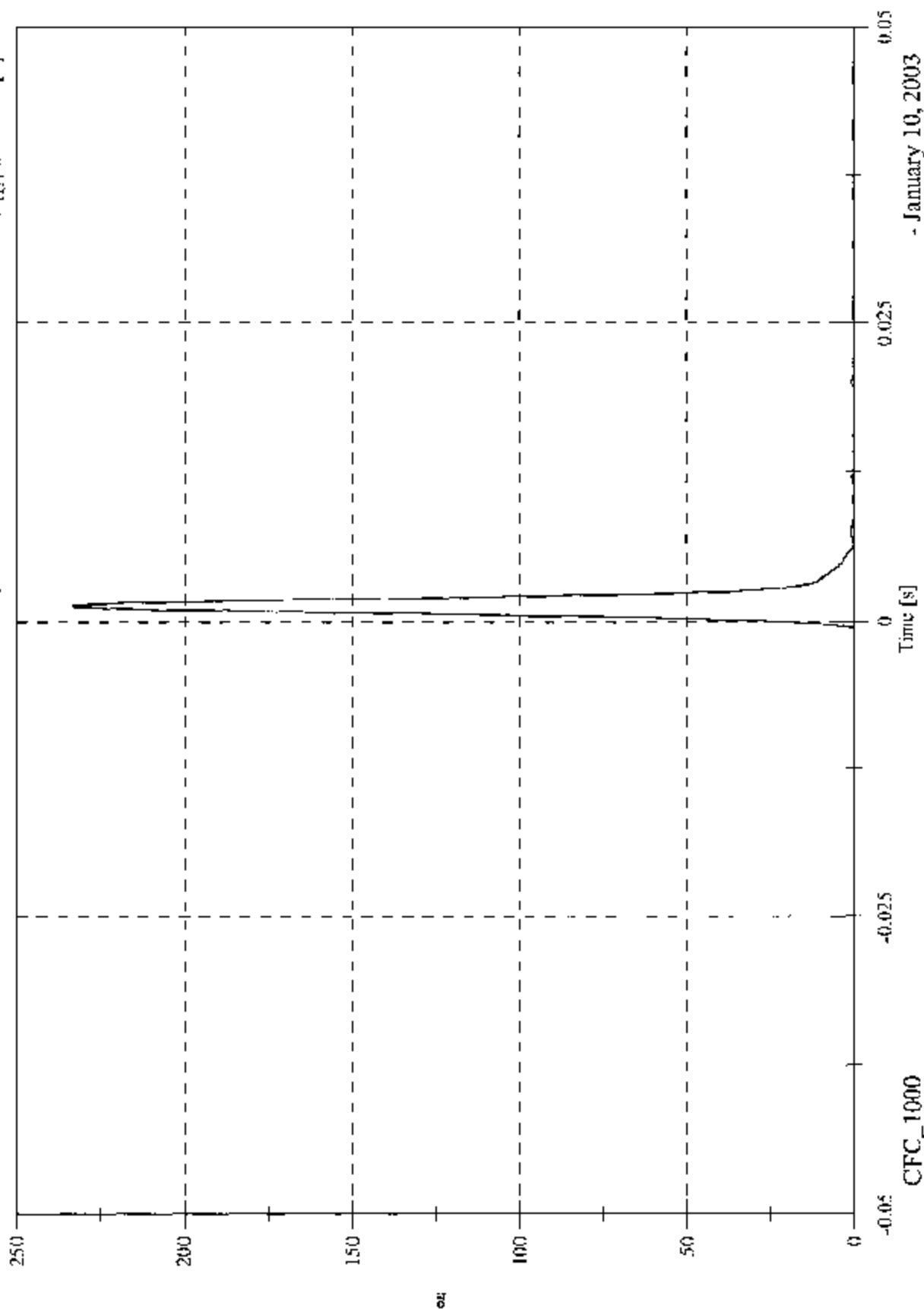


- January 10, 2003

FMVSS 201U - Head Form Calibration Drops

Max: 233.4 [g] at 0.001 [s]  
Min: 0.0 [g] at 0.049 [s]

Headform Resultant



PART 572L  
HEAD DROP PRE-TEST

|                                 |                                         |              |
|---------------------------------|-----------------------------------------|--------------|
| MANUFACTURER:                   | APPLIED SAFETY TECHNOLOGIES CORPORATION |              |
| SERIAL NUMBER:                  | 1255                                    |              |
| CALIBRATION DATE:               | January 10, 2003                        |              |
| TEST PARAMETER                  | SPECIFICATION                           | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                            | 21           |
| RELATIVE HUMIDITY               | 10% to 70%                              | 21           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                        | 273.8        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                           | 4.0          |
| IS ACCELERATION CURVE UNIMODAL? | YES                                     | YES          |

HEAD ACCELEROMETER CALIBRATION INFORMATION

| I.D. NUMBER      | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J41006        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J40994        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J41007        | 9/02                     | 3/03                     |

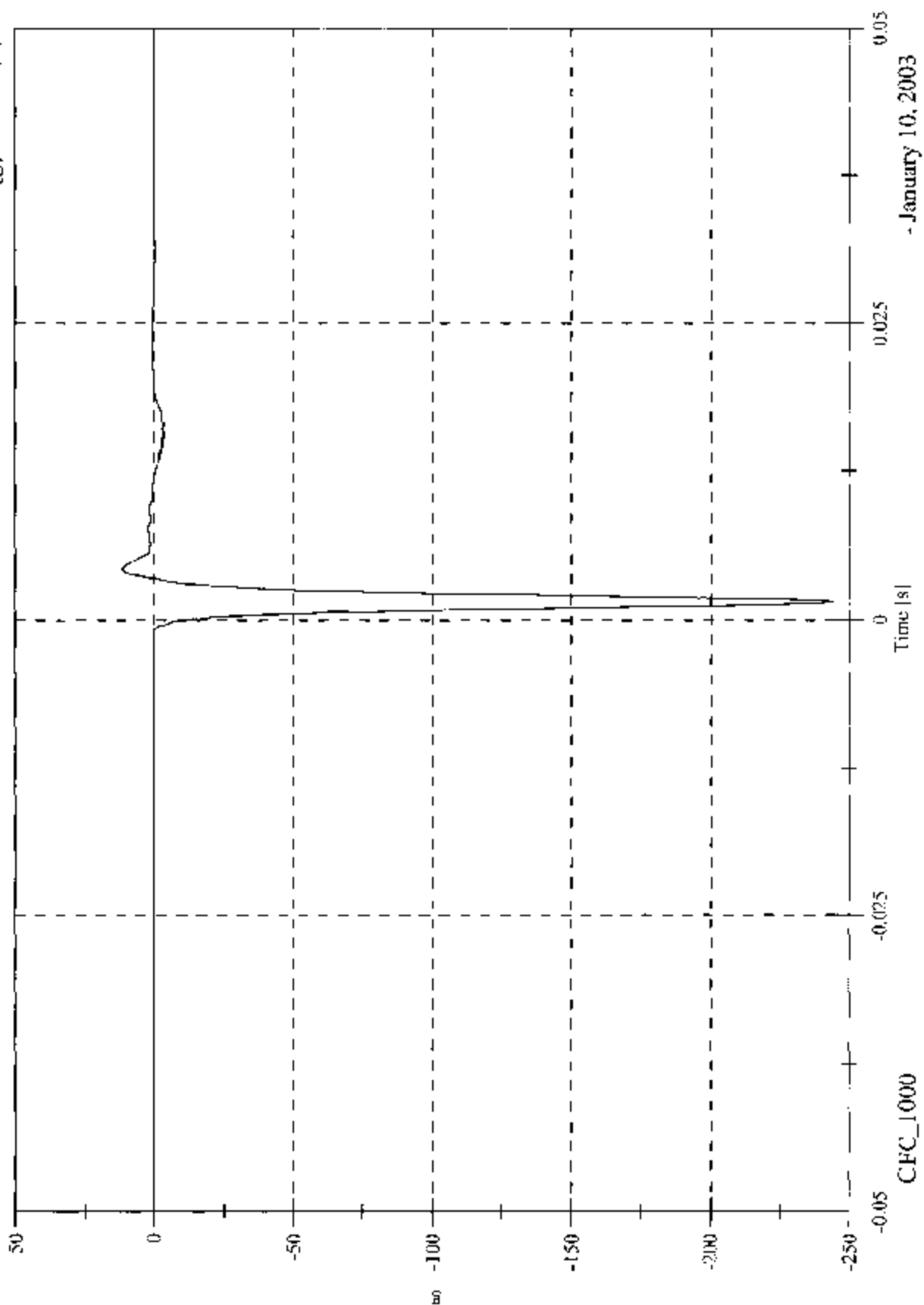
REMARKS:

FMVSS 201U - Head Form Calibration Drops

Max: 11.3 [g] at 0.004 [s]

Min: -243.9 [g] at 0.002 [s]

Headform X Acceleration

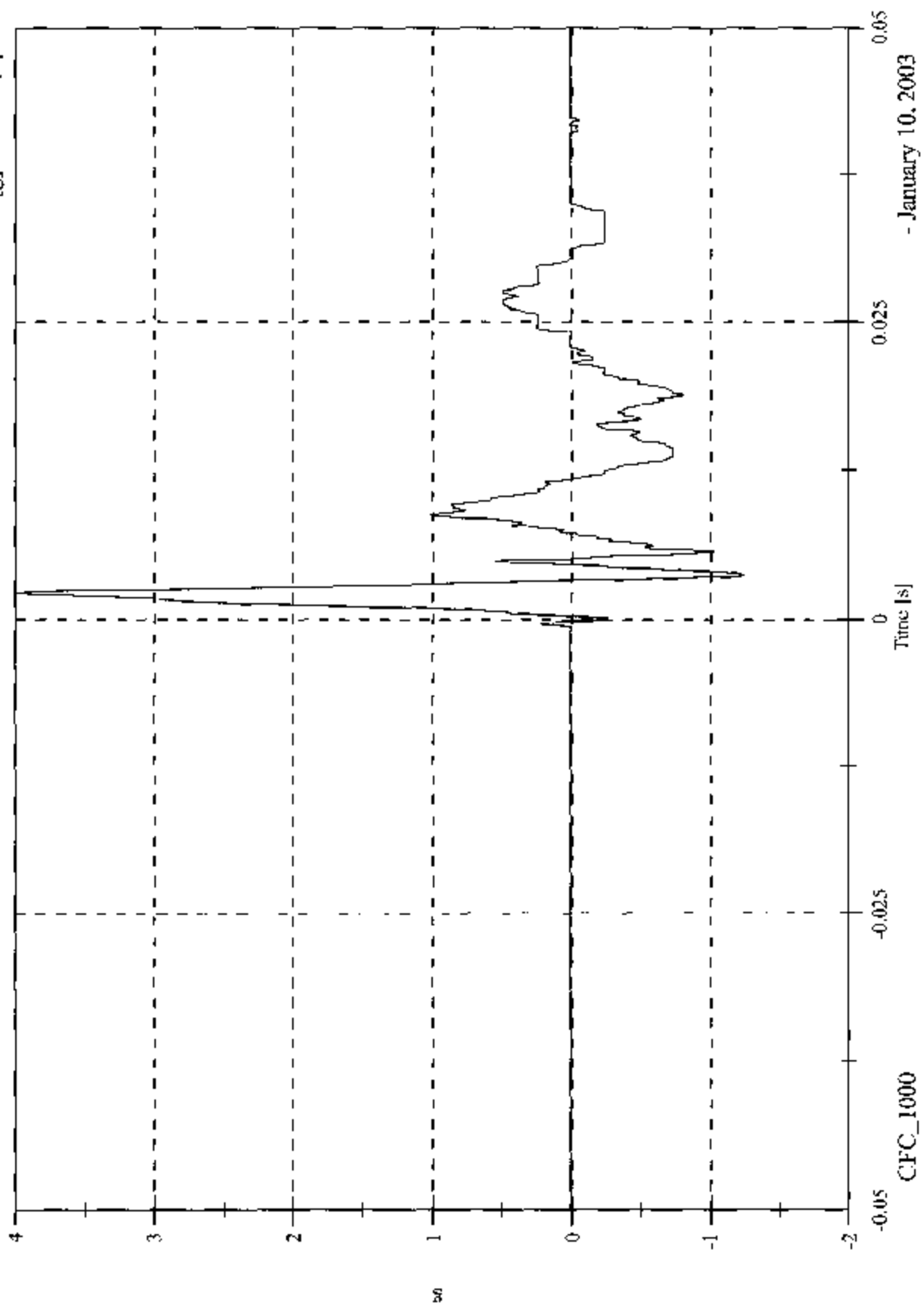


- January 10, 2003

FMVSS 201U - Head Form Calibration Drops

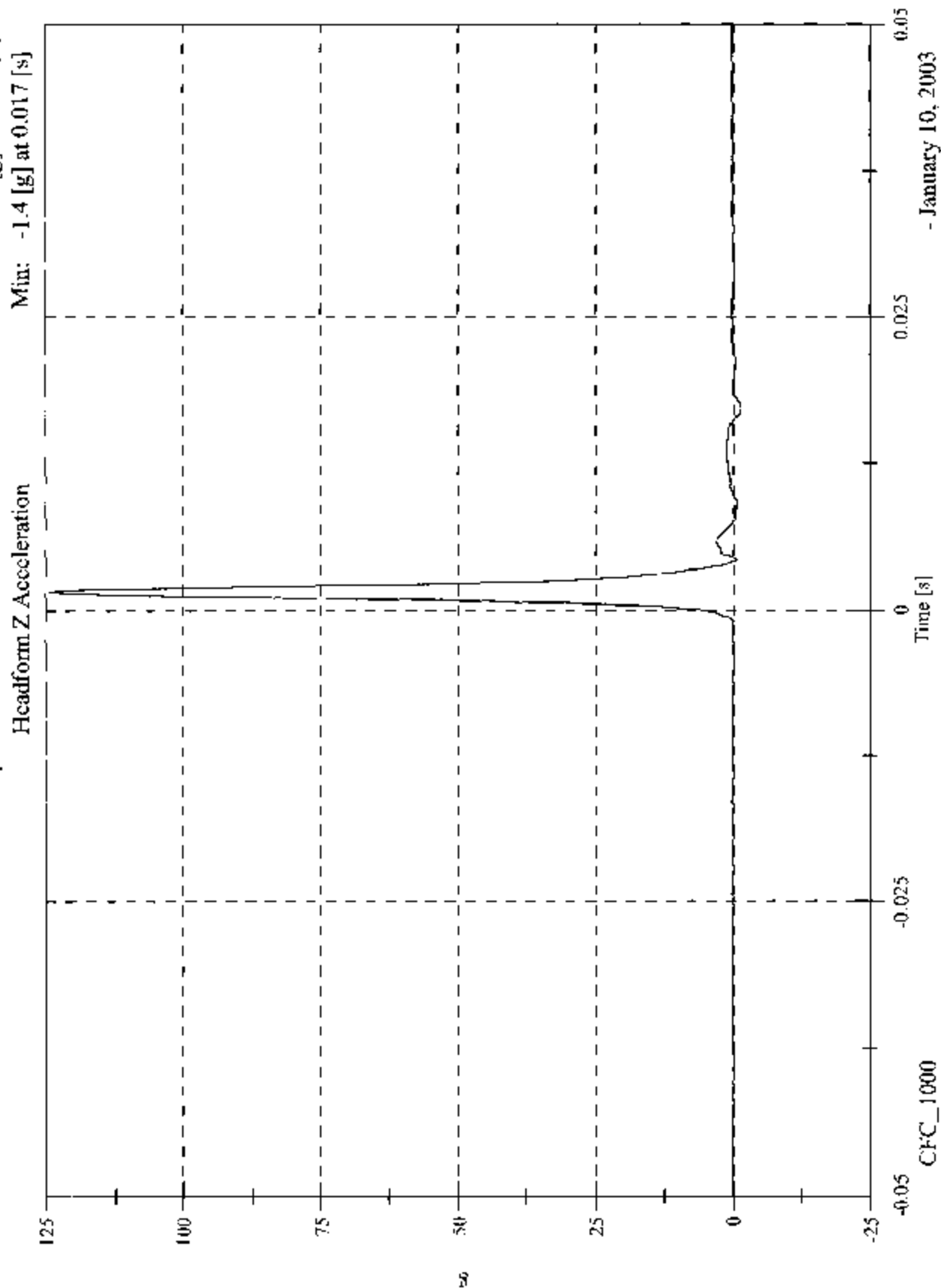
Max: 4.0 [g] at 0.002 [s]  
Min: -1.2 [g] at 0.004 [s]

Headform Y Acceleration



- January 10, 2003

# PMVSS 201U - Head Form Calibration Drops

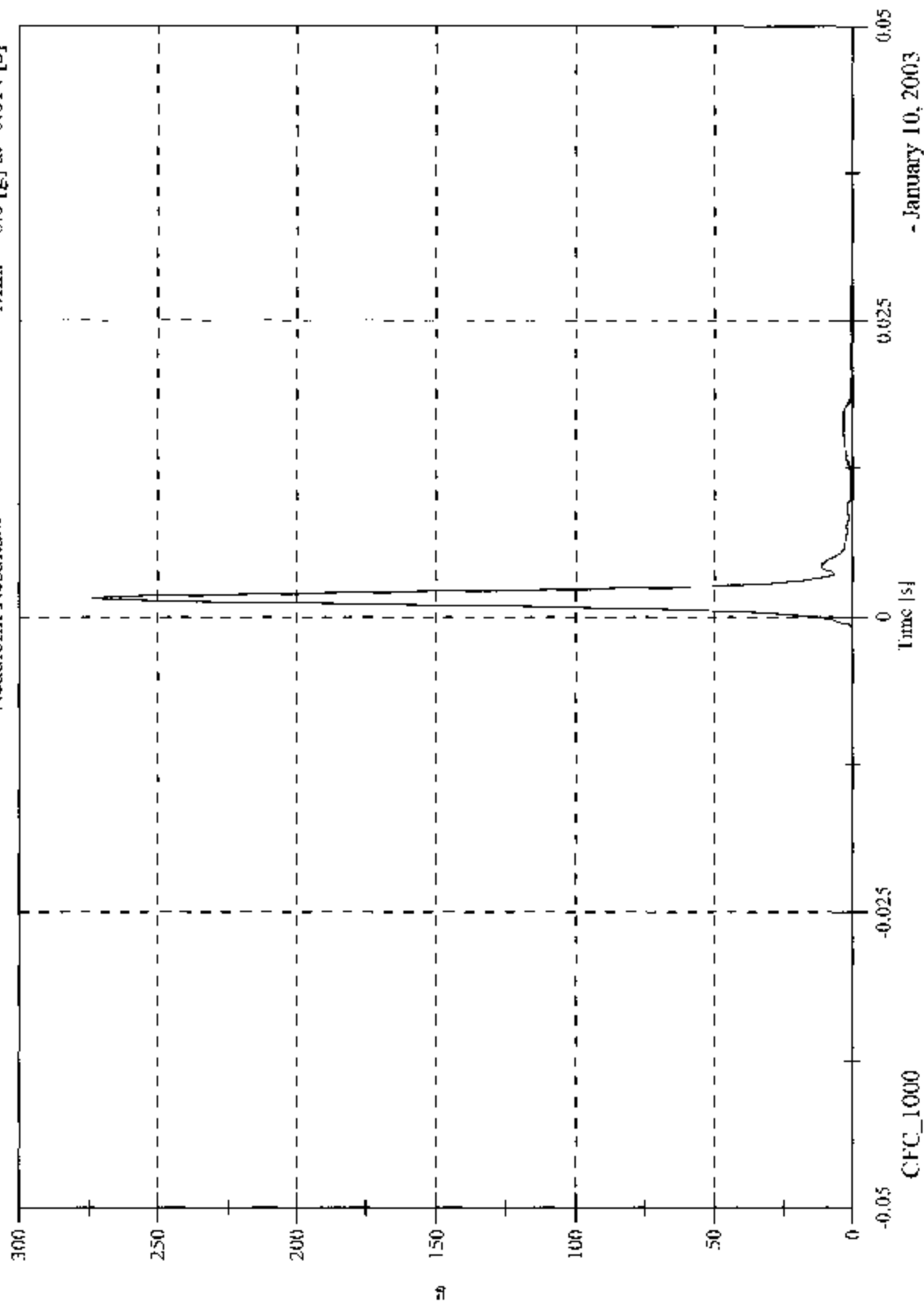




# FMVSS 201U - Ilead Form Calibration Drops

Max: 273.8 [g] at 0.002 [s]  
Min: 0.0 [g] at -0.014 [s]

Ileadform Resultant



PART 572L  
HEAD DROP POST-TEST

|                                 |                                   |              |
|---------------------------------|-----------------------------------|--------------|
| MANUFACTURER:                   | FIRST TECHNOLOGIES SAFETY SYSTEMS |              |
| SERIAL NUMBER:                  | 0642                              |              |
| CALIBRATION DATE:               | January 23, 2003                  |              |
| TEST PARAMETER                  | SPECIFICATION                     | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                      | 21           |
| RELATIVE HUMIDITY               | 10% to 70%                        | 19           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                  | 244.6        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                     | 1.9          |
| IS ACCELERATION CURVE UNIMODAL? | YES                               | YES          |

HEAD ACCELEROMETER CALIBRATION INFORMATION

| ID. NUMBER       | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J24876        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J33030        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J31009        | 9/02                     | 3/03                     |

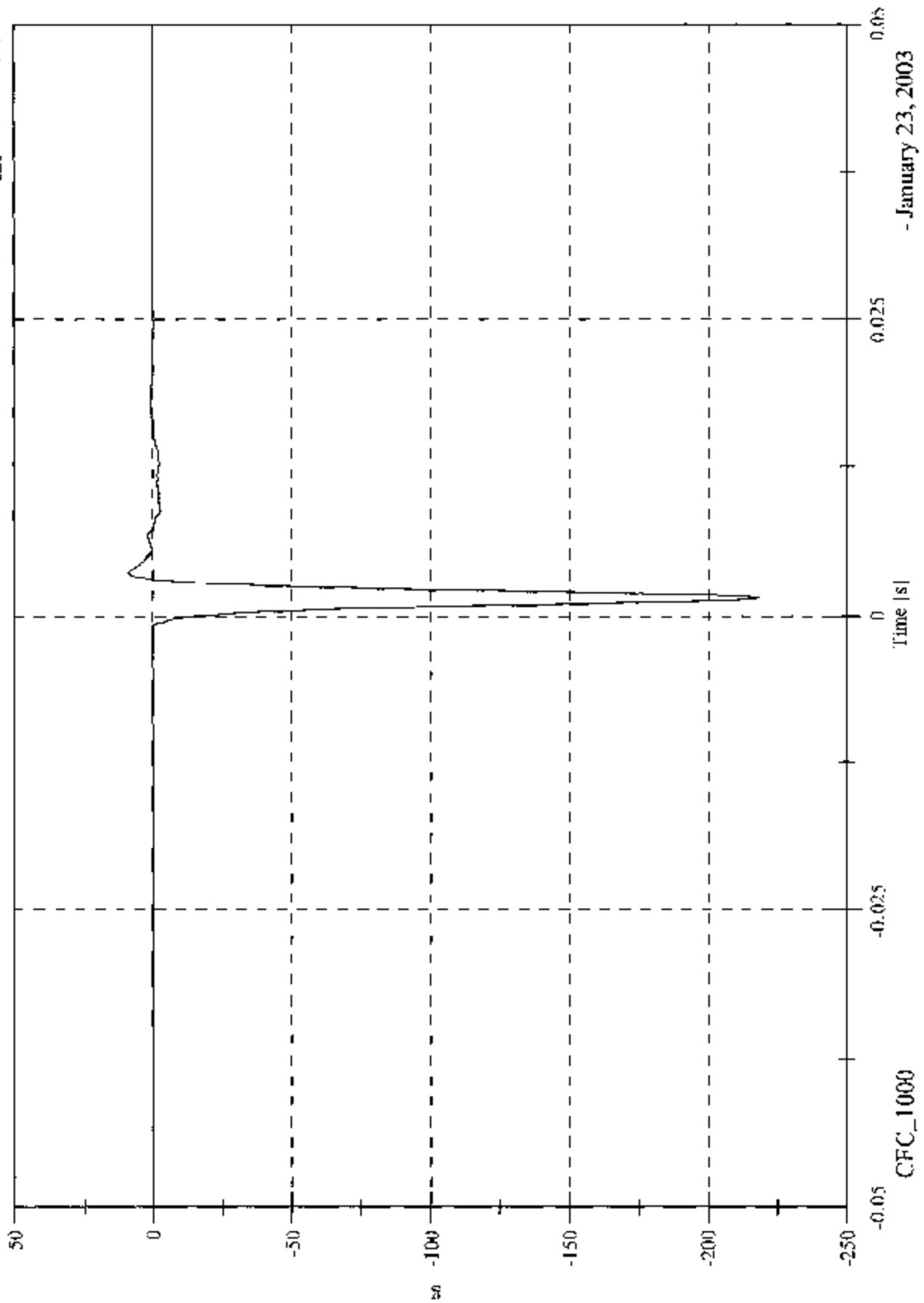
REMARKS:

FMVSS 201U - Head Form Calibration Drops

Max: 8.7 [g] at 0.004 [s]

Min: -218.4 [g] at 0.002 [s]

Headform X Acceleration

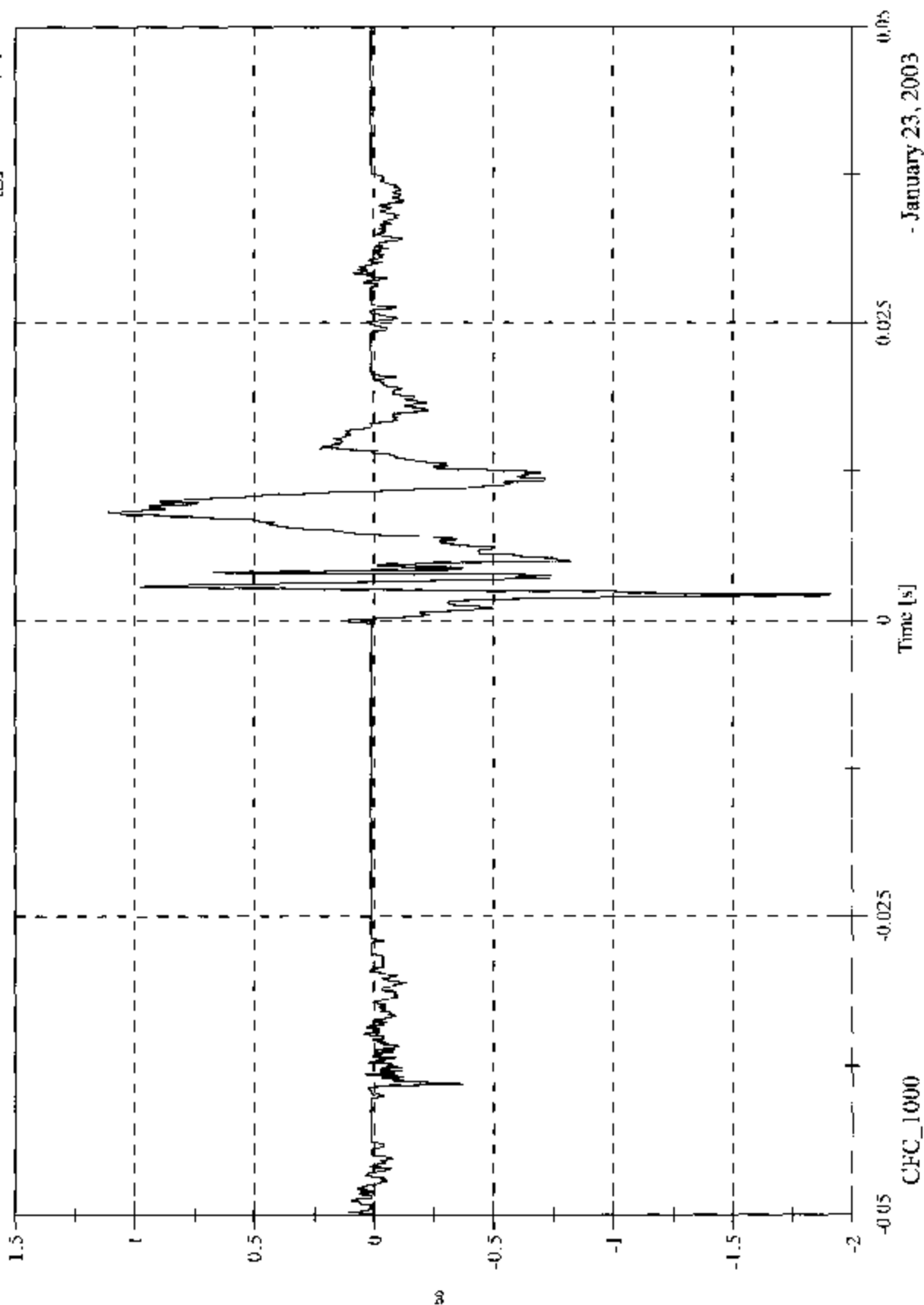


- January 23, 2003

# FMVSS 201U - Head Form Calibration Drops

Max: 1.1 [g] at 0.009 [s]  
Min: -1.9 [g] at 0.002 [s]

Headform Y Acceleration

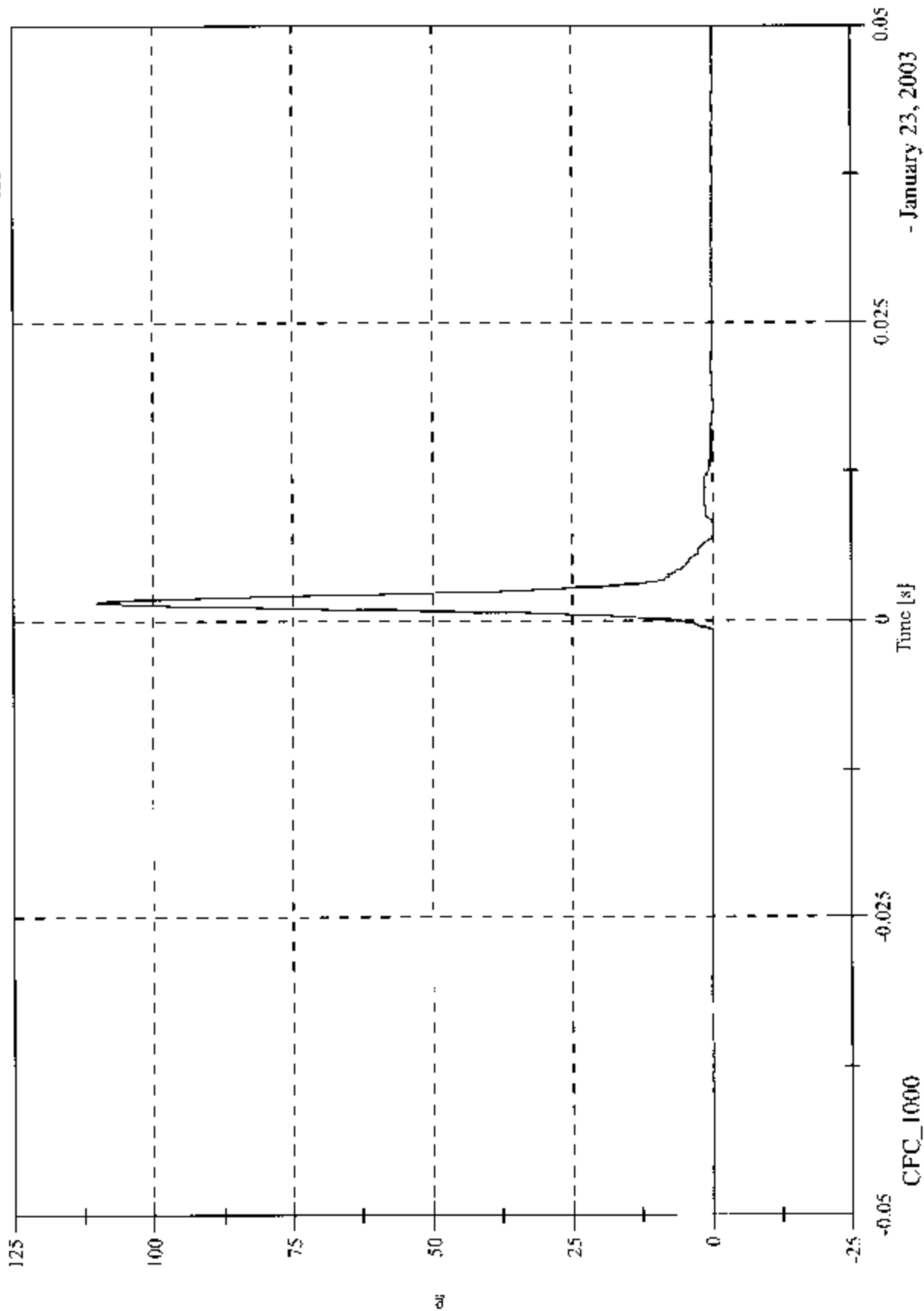


- January 23, 2003

# FMVSS 201U - Head Form Calibration Drops

Headform Z Acceleration

Max: 110.2 [g] at 0.002 [s]  
Min: -0.3 [g] at 0.018 [s]

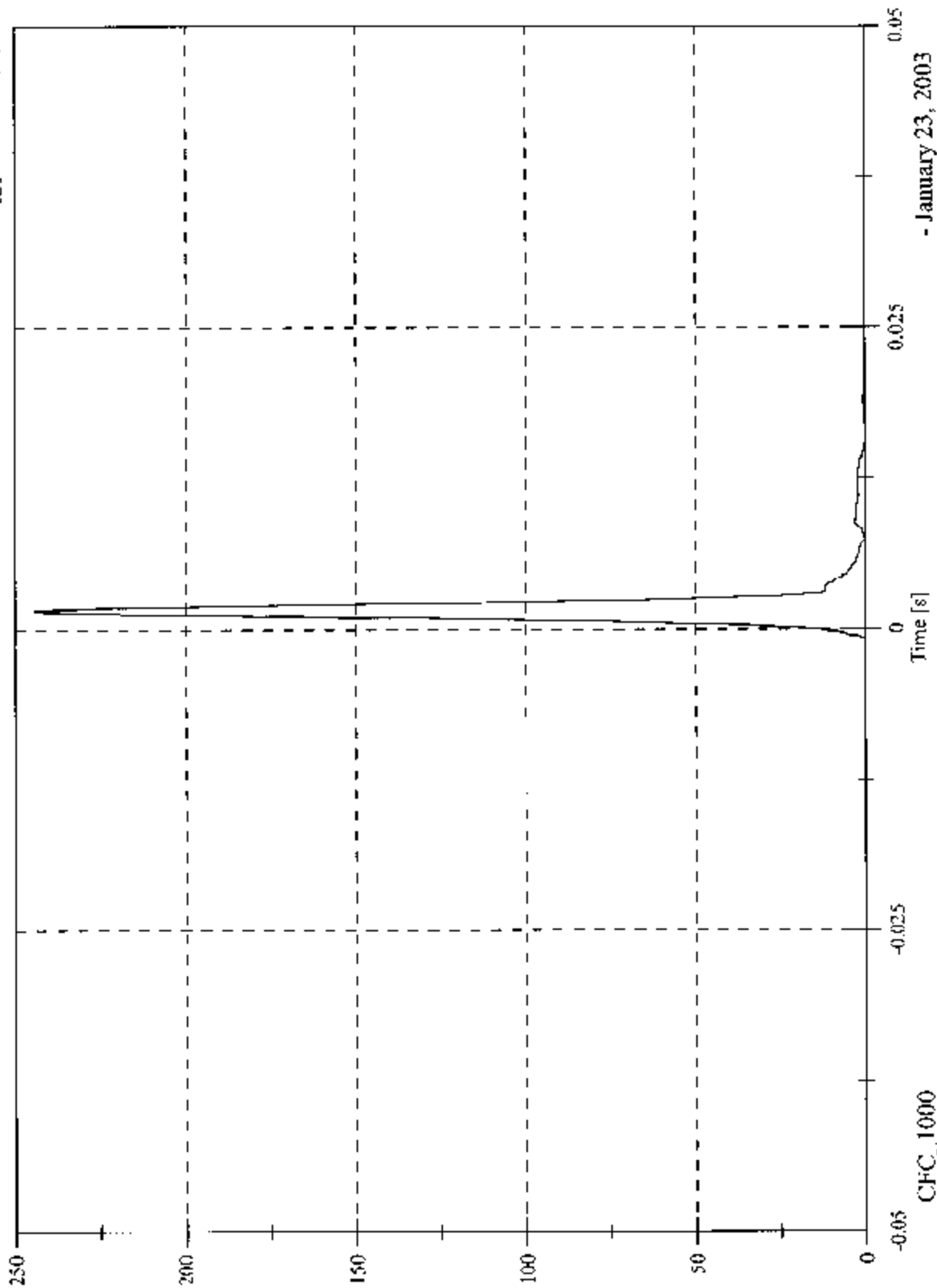


- January 23, 2003

FMVSS 201U - Head Form Calibration Drops

Headform Resultant

Max: 244.6 [g] at 0.002 [s]  
Min: 0.0 [g] at -0.030 [s]



- January 23, 2003

PART 572L  
HEAD DROP POST-TEST

|                                 |                                   |              |
|---------------------------------|-----------------------------------|--------------|
| MANUFACTURER:                   | FIRST TECHNOLOGIES SAFETY SYSTEMS |              |
| SERIAL NUMBER:                  | 805                               |              |
| CALIBRATION DATE:               | January 23, 2003                  |              |
| TEST PARAMETER                  | SPECIFICATION                     | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                      | 2°           |
| RELATIVE HUMIDITY               | 10% to 70%                        | 19           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                  | 230.5        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                     | 3.6          |
| IS ACCELERATION CURVE UNIMODAL? | YES                               | YES          |

HEAD ACCELEROMETER CALIBRATION INFORMATION

| I.D. NUMBER      | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J38127        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J37980        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J37854        | 9/02                     | 3/03                     |

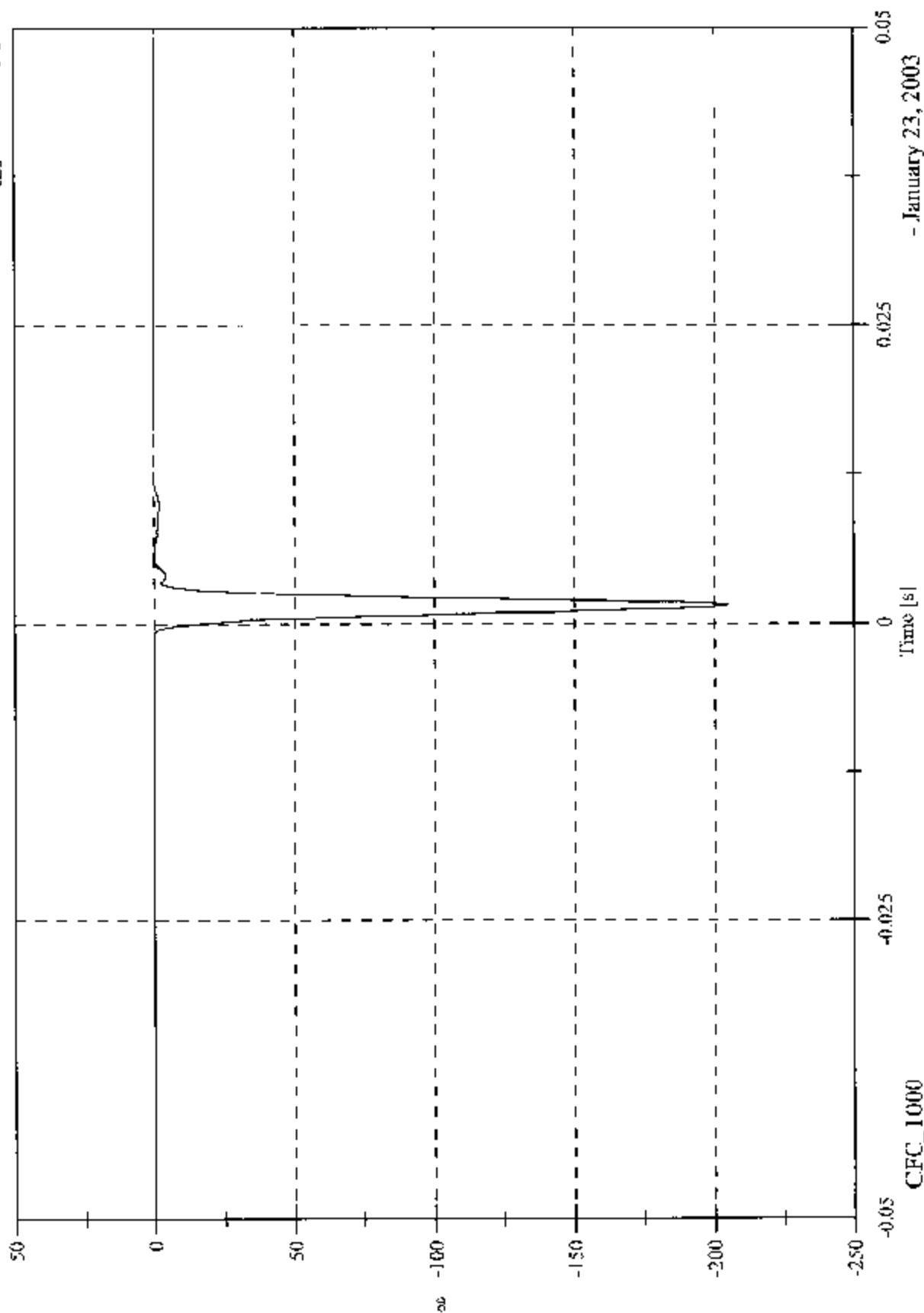
REMARKS:

FMVSS 201U - Head Form Calibration Drops

Max: 0.5 [g] at 0.005 [s]

Min: -204.8 [g] at 0.001 [s]

Headform X Acceleration



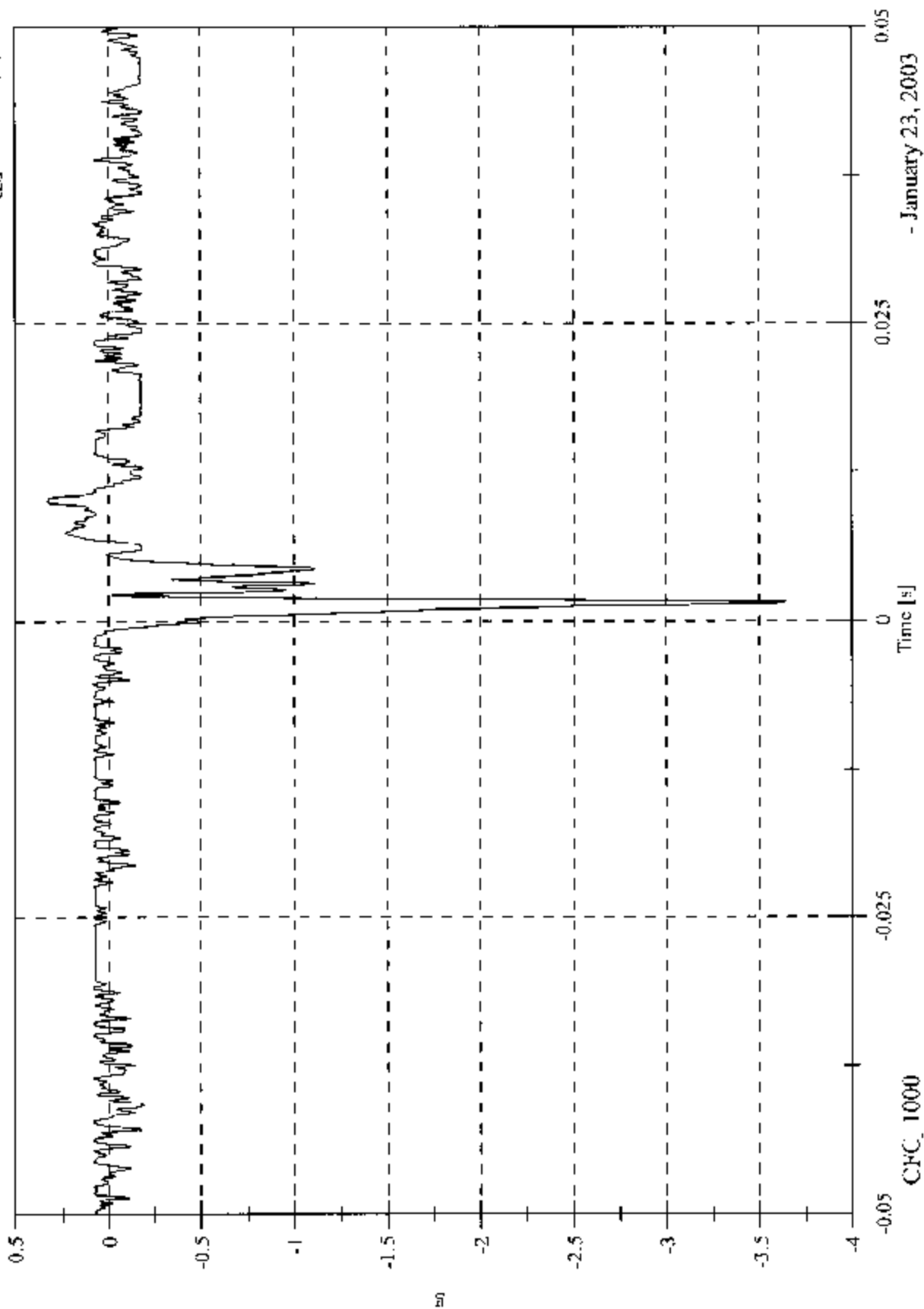
- January 23, 2003



# FMVSS 201U - Head Form Calibration Drops

Max: 0.3 [g] at 0.010 [s]  
Min: -3.6 [g] at 0.001 [s]

Headform Y Acceleration



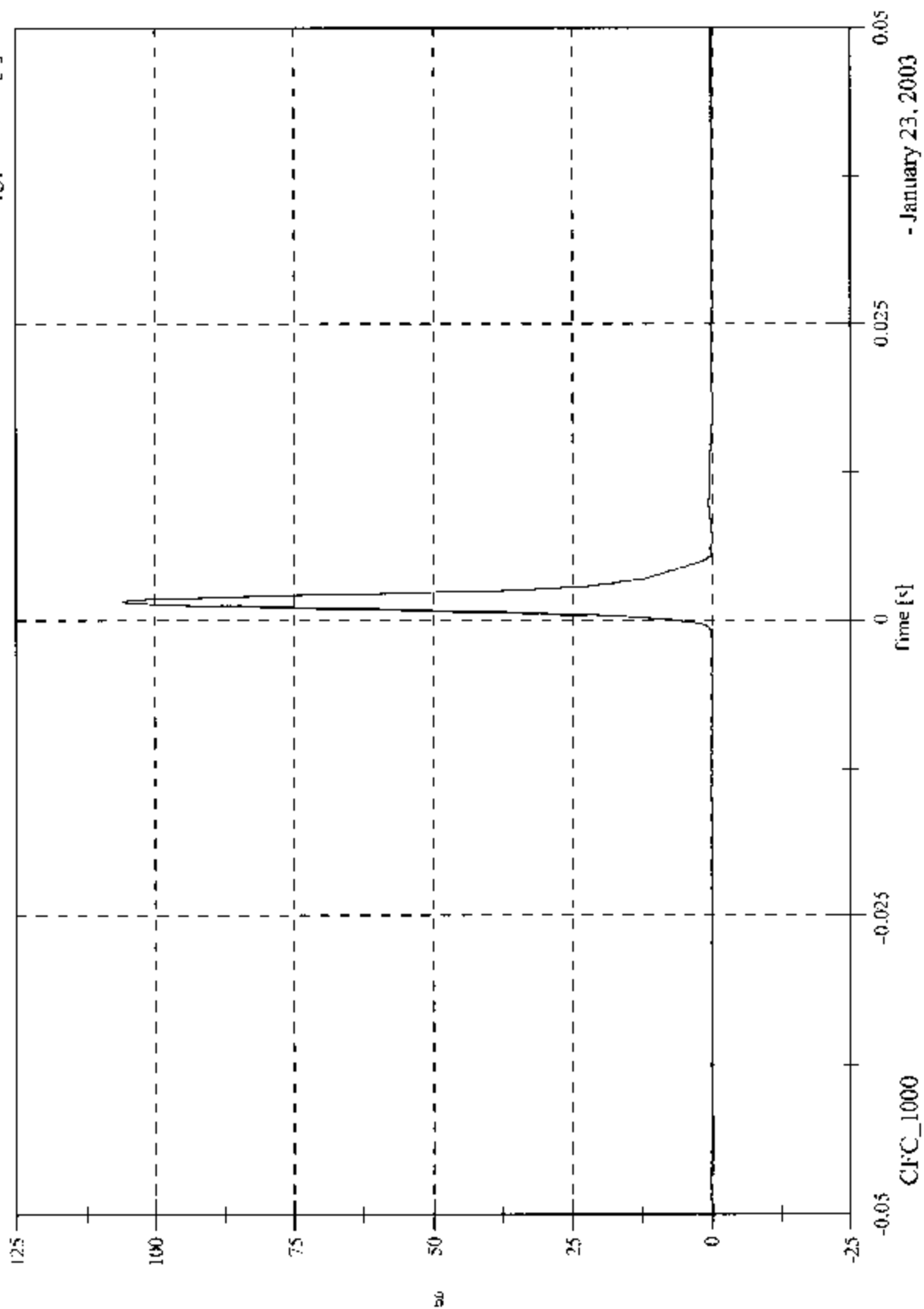
- January 23, 2003

FMVSS 201U - Head Form Calibration Drops

Max: 106.0 [g] at 0.002 [s]

Min: -0.1 [g] at 0.007 [s]

Headform Z Acceleration

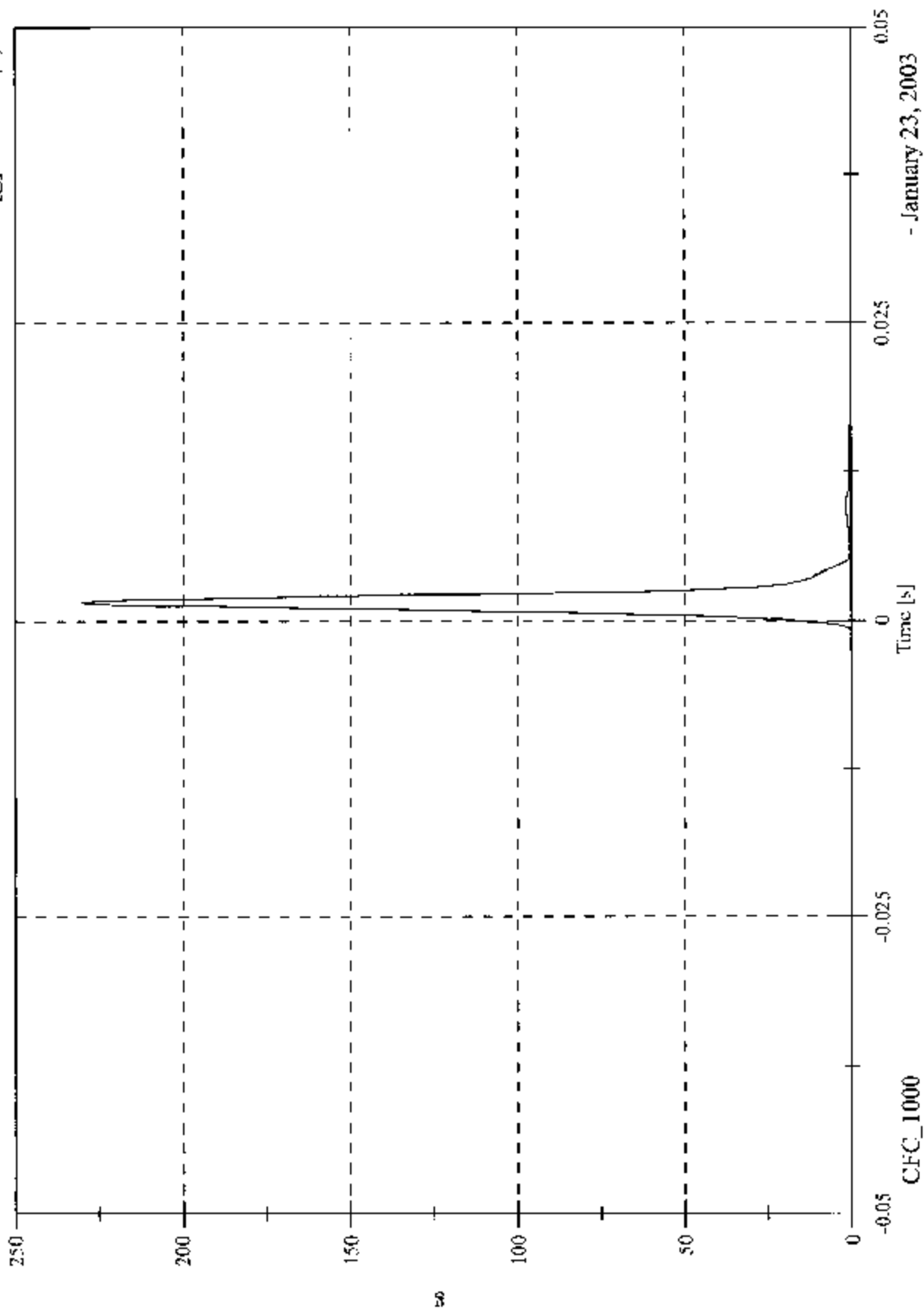


- January 23, 2003

FMVSS 201U - Ilead Form Calibration Drops

Max: 230.5 [g] at 0.001 [s]  
Min: 0.0 [g] at -0.046 [s]

Headform Resultant



- January 23, 2003

PART 572L  
HEAD DROP POST-TEST

|                                 |                                         |              |
|---------------------------------|-----------------------------------------|--------------|
| MANUFACTURER:                   | APPLIED SAFETY TECHNOLOGIES CORPORATION |              |
| SERIAL NUMBER:                  | 0062                                    |              |
| CALIBRATION DATE:               | January 23, 2003                        |              |
| TEST PARAMETER                  | SPECIFICATION                           | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                            | 21           |
| RELATIVE HUMIDITY               | 10% to 70%                              | 19           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                        | 231.9        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                           | 9.8          |
| IS ACCELERATION CURVE UNIMODAL? | YES                                     | YES          |

HEAD ACCELEROMETER CALIBRATION INFORMATION

| ID NUMBER        | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J33127        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J33019        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J32782        | 9/02                     | 3/03                     |

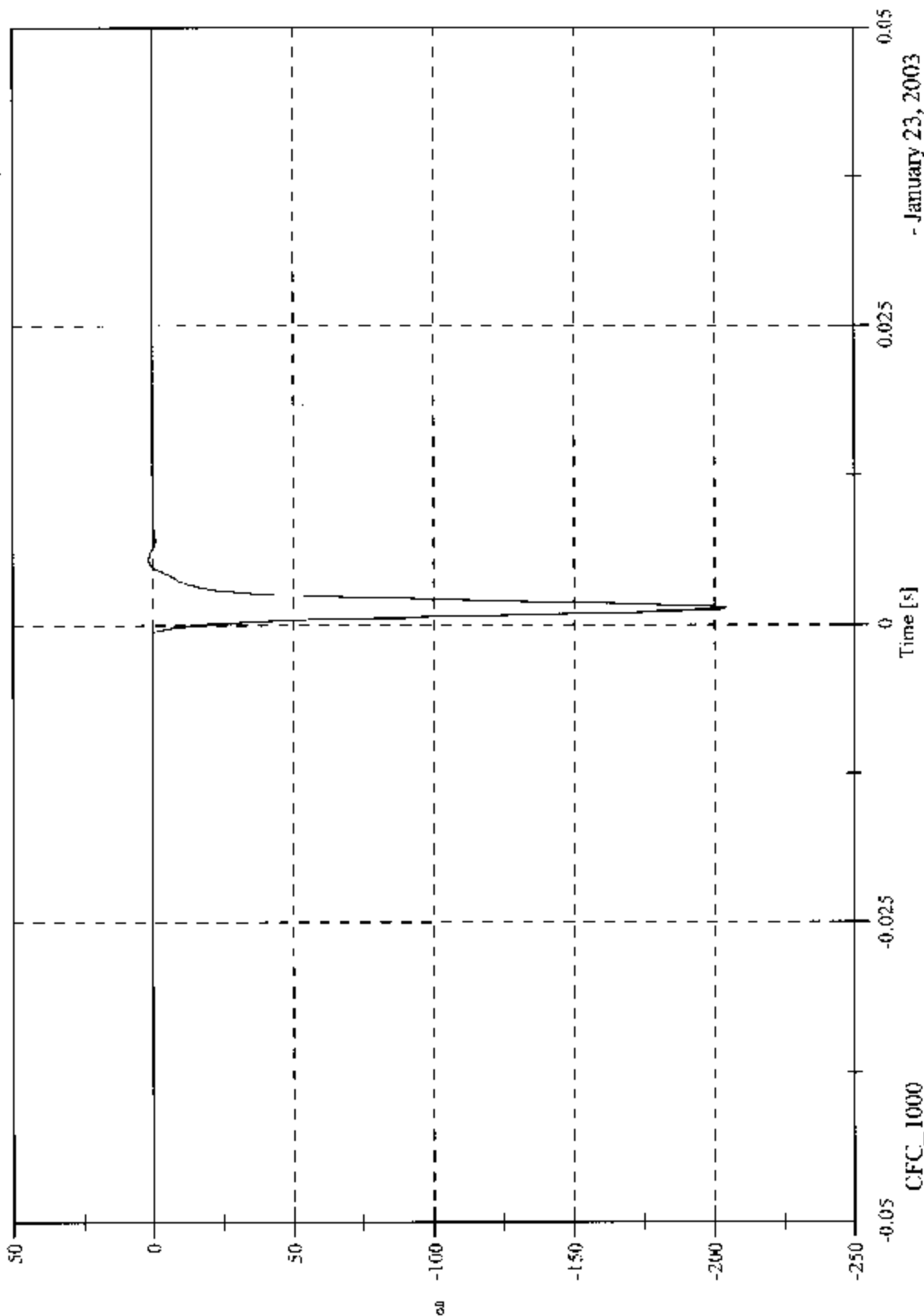
REMARKS:

FMVSS 201U - Head Form Calibration Drops

Max: 1.5 [g] at 0.005 [s]

Min: -204.3 [g] at 0.001 [s]

Headform X Acceleration

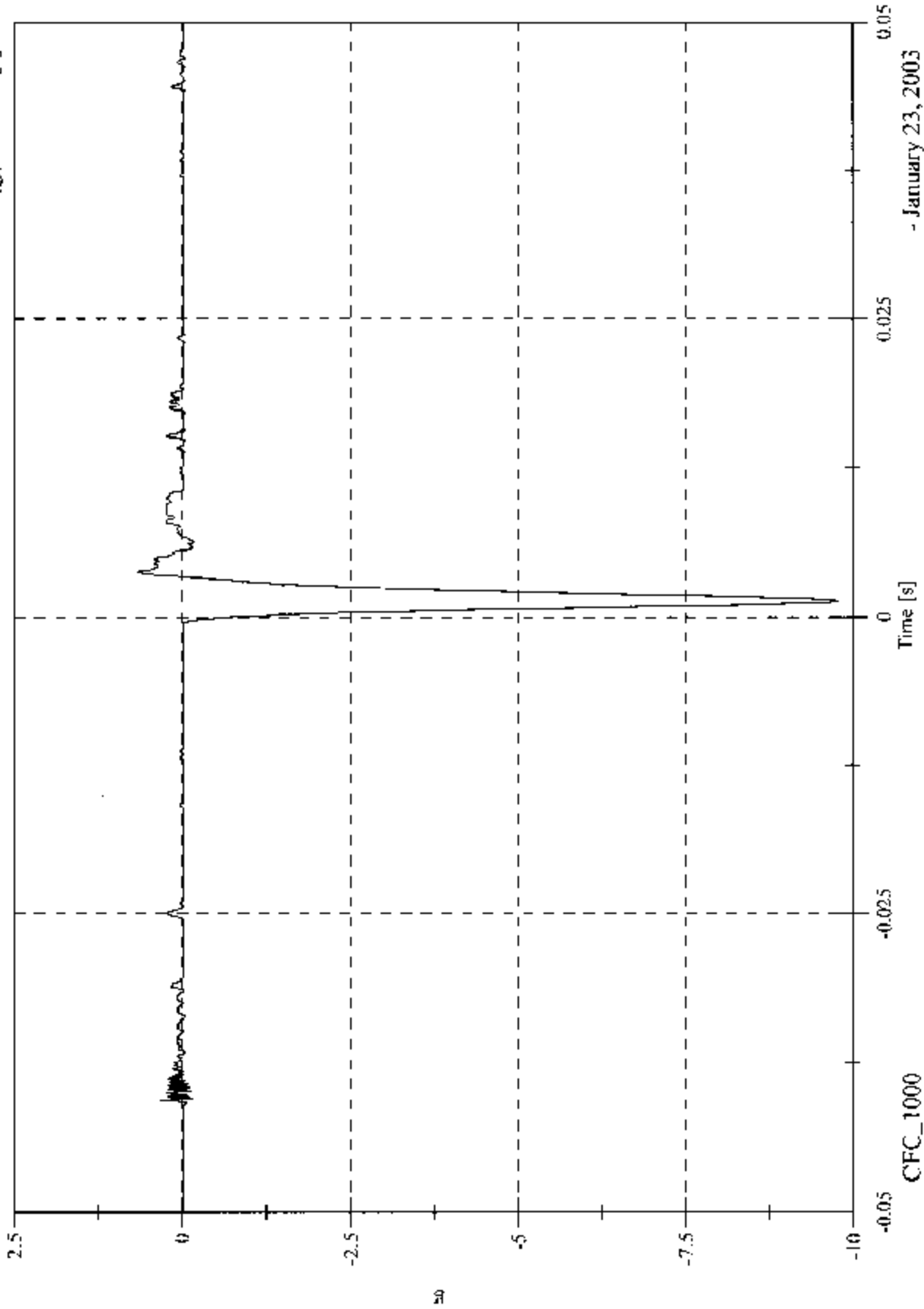


- January 23, 2003

# FMVSS 201U - Head Form Calibration Drops

Max: 0.7 [g] at 0.004 [s]  
Min: -9.8 [g] at 0.001 [s]

Headform Y Acceleration

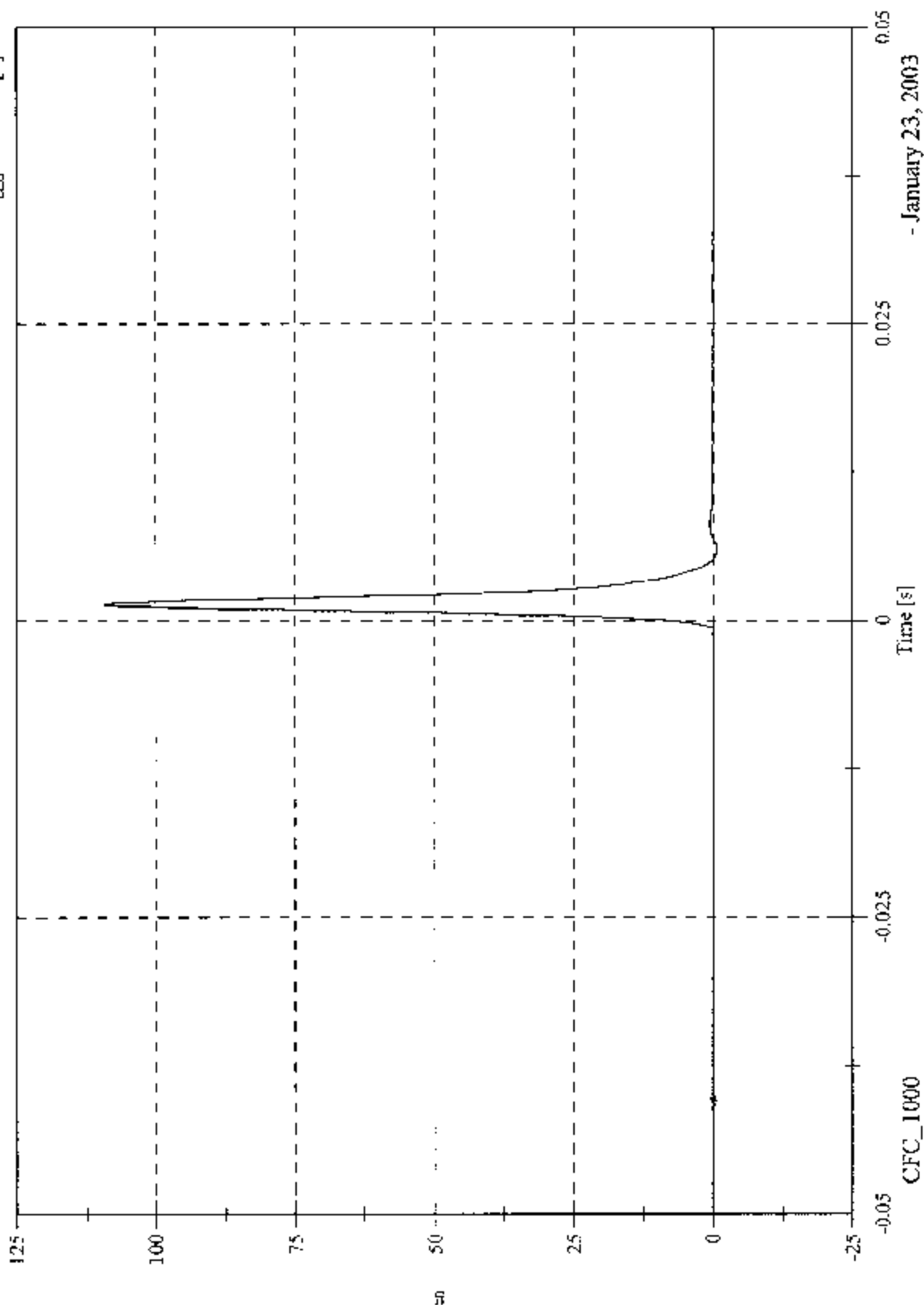


- January 23, 2003

FMVSS 201U - Head Form Calibration Drops

Headform Z Acceleration

Max: 109.3 [g] at 0.001 [s]  
Min: -0.6 [g] at 0.006 [s]

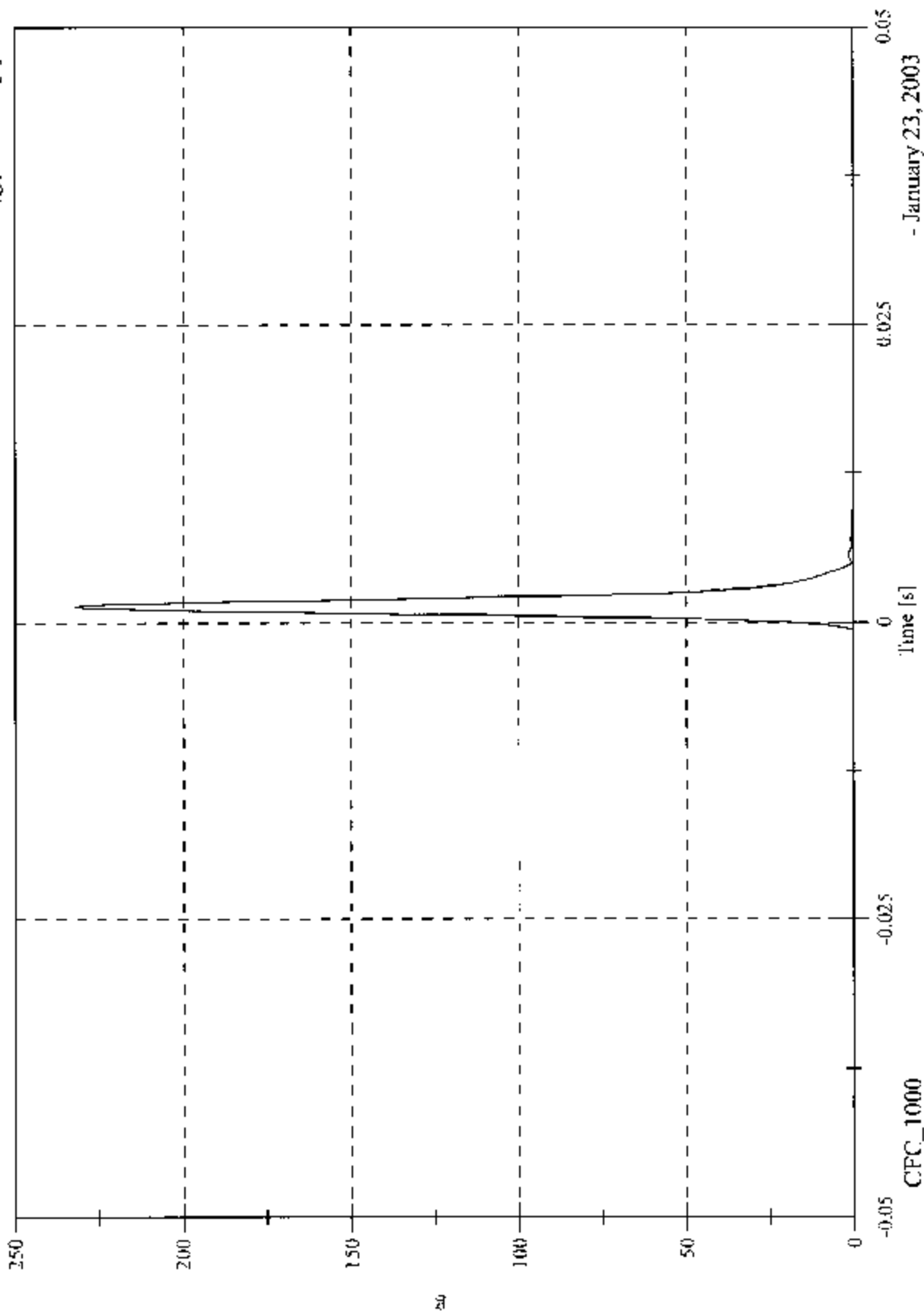


- January 23, 2003

FMVSS 201U - Head Form Calibration Drops

Headform Resultant

Max: 231.9 [g] at 0.001 [s]  
Min: 0.0 [g] at 0.038 [s]



- January 23, 2003



**PART 572L  
HEAD DROP POST-TEST**

|                                        |                                                |                     |
|----------------------------------------|------------------------------------------------|---------------------|
| <b>MANUFACTURER:</b>                   | <b>APPLIED SAFETY TECHNOLOGIES CORPORATION</b> |                     |
| <b>SERIAL NUMBER:</b>                  | <b>0355</b>                                    |                     |
| <b>CALIBRATION DATE:</b>               | <b>January 23, 2003</b>                        |                     |
| <b>TEST PARAMETER</b>                  | <b>SPECIFICATION</b>                           | <b>TEST RESULTS</b> |
| <b>TEMPERATURE</b>                     | 19°C to 26°C                                   | 21                  |
| <b>RELATIVE HUMIDITY</b>               | 10% to 70%                                     | 19                  |
| <b>PEAK RESULTANT ACCELERATION</b>     | 225 Gs to 275 Gs                               | 233.4               |
| <b>PEAK LATERAL ACCELERATION</b>       | 15 Gs Maximum                                  | 2.8                 |
| <b>IS ACCELERATION CURVE UNIMODAL?</b> | <b>YES</b>                                     | <b>YES</b>          |

**HEAD ACCELEROMETER CALIBRATION INFORMATION**

| <b>ID. NUMBER</b>       | <b>MANUFACTURER</b> | <b>MODEL NUMBER</b> | <b>SERIAL NUMBER</b> | <b>DATE OF LAST CALIBRATION</b> | <b>DATE OF NEXT CALIBRATION</b> |
|-------------------------|---------------------|---------------------|----------------------|---------------------------------|---------------------------------|
| <b>1 - LONGITUDINAL</b> | <b>ENDEVCO</b>      | <b>7264-2000T</b>   | <b>J28671</b>        | <b>9/02</b>                     | <b>3/03</b>                     |
| <b>2 - LATERAL</b>      | <b>ENDEVCO</b>      | <b>7264-2000T</b>   | <b>J32779</b>        | <b>9/02</b>                     | <b>3/03</b>                     |
| <b>3 - VERTICAL</b>     | <b>ENDEVCO</b>      | <b>7264-2000T</b>   | <b>J25854</b>        | <b>9/02</b>                     | <b>3/03</b>                     |

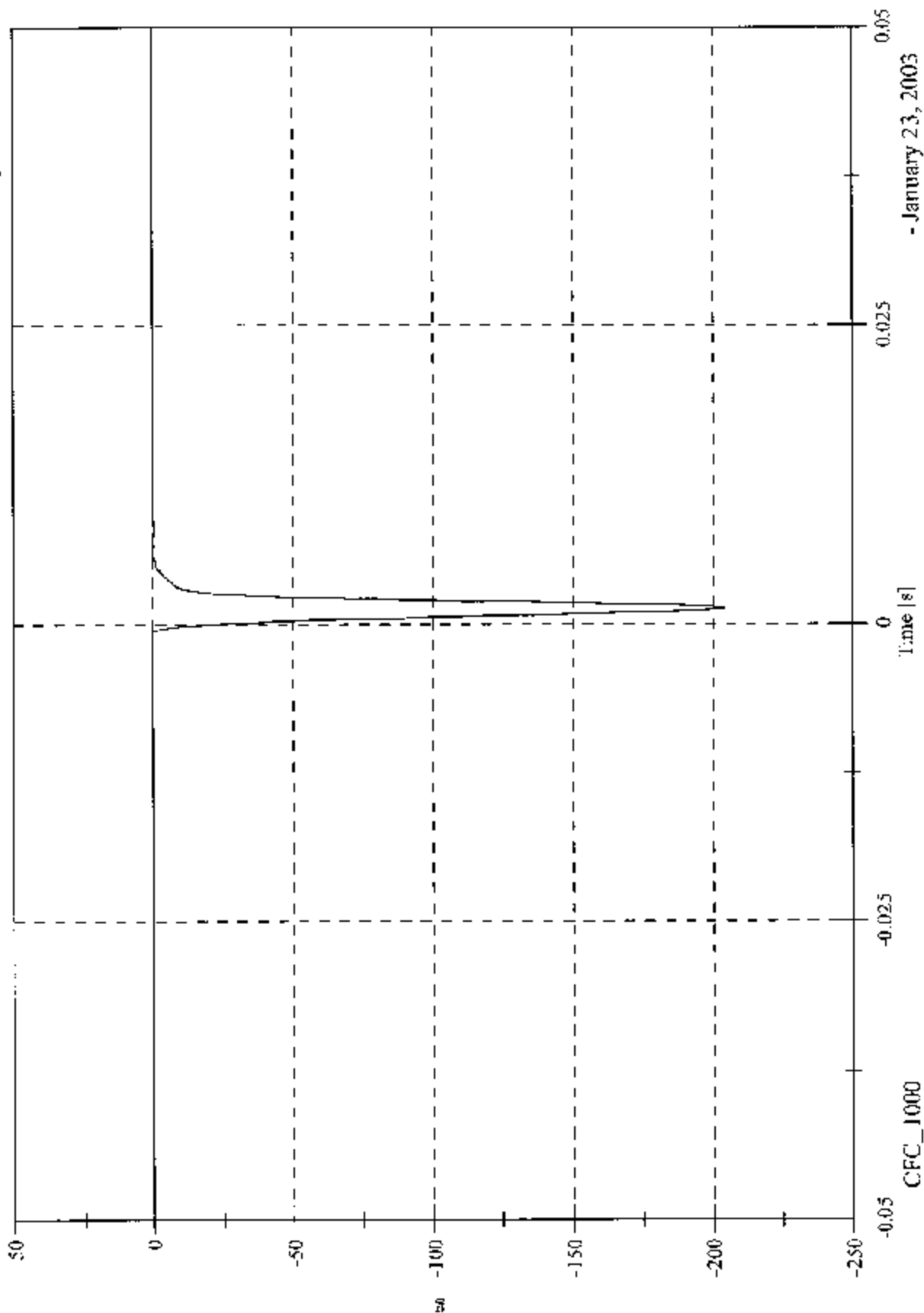
**REMARKS:**

# FMVSS 201U - Head Form Calibration Drops

Max: 0.3 [g] at 0.010 [s]

Min: -204.3 [g] at 0.001 [s]

Headform X Acceleration

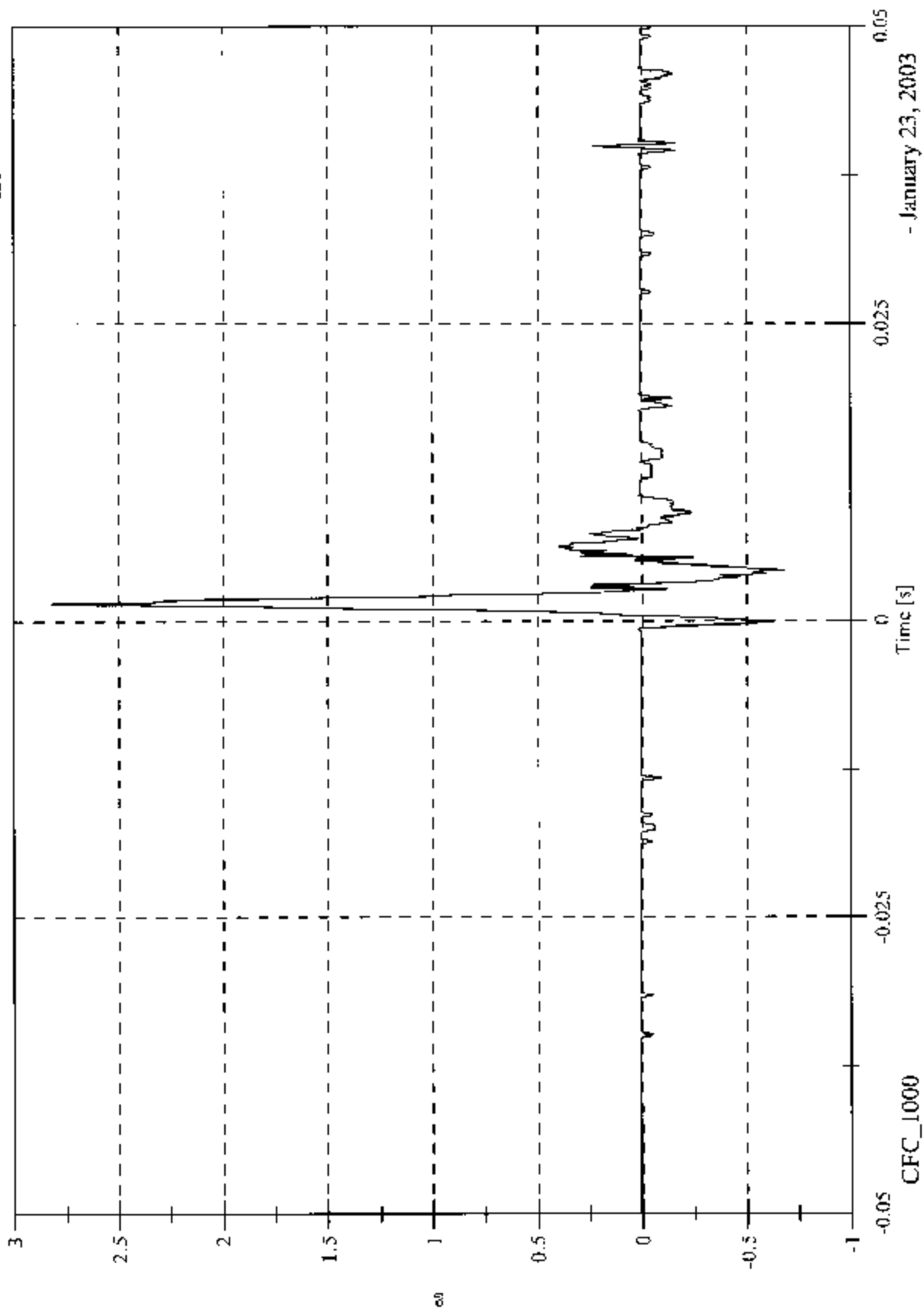


- January 23, 2003

FMVSS 201U - Head Form Calibration Drops

Max: 2.8 [g] at 0.001 [s]  
Min: -0.7 [g] at 0.004 [s]

Headform Y Acceleration



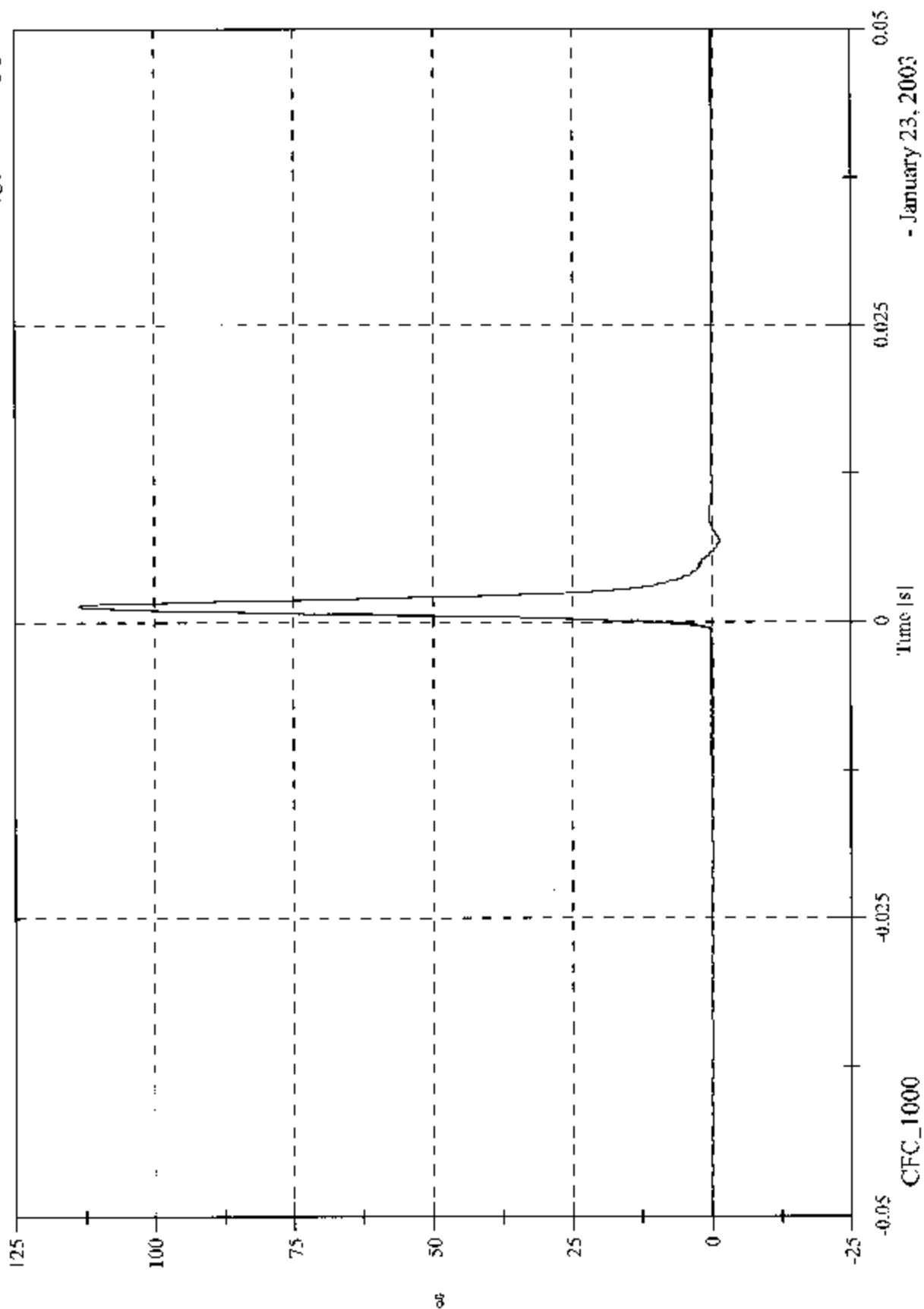
- January 23, 2003

# FMVSS 201U - Head Form Calibration Drops

Max: 113.7 [g] at 0.001 [s]

Min: -1.4 [g] at 0.007 [s]

Headform Z Acceleration

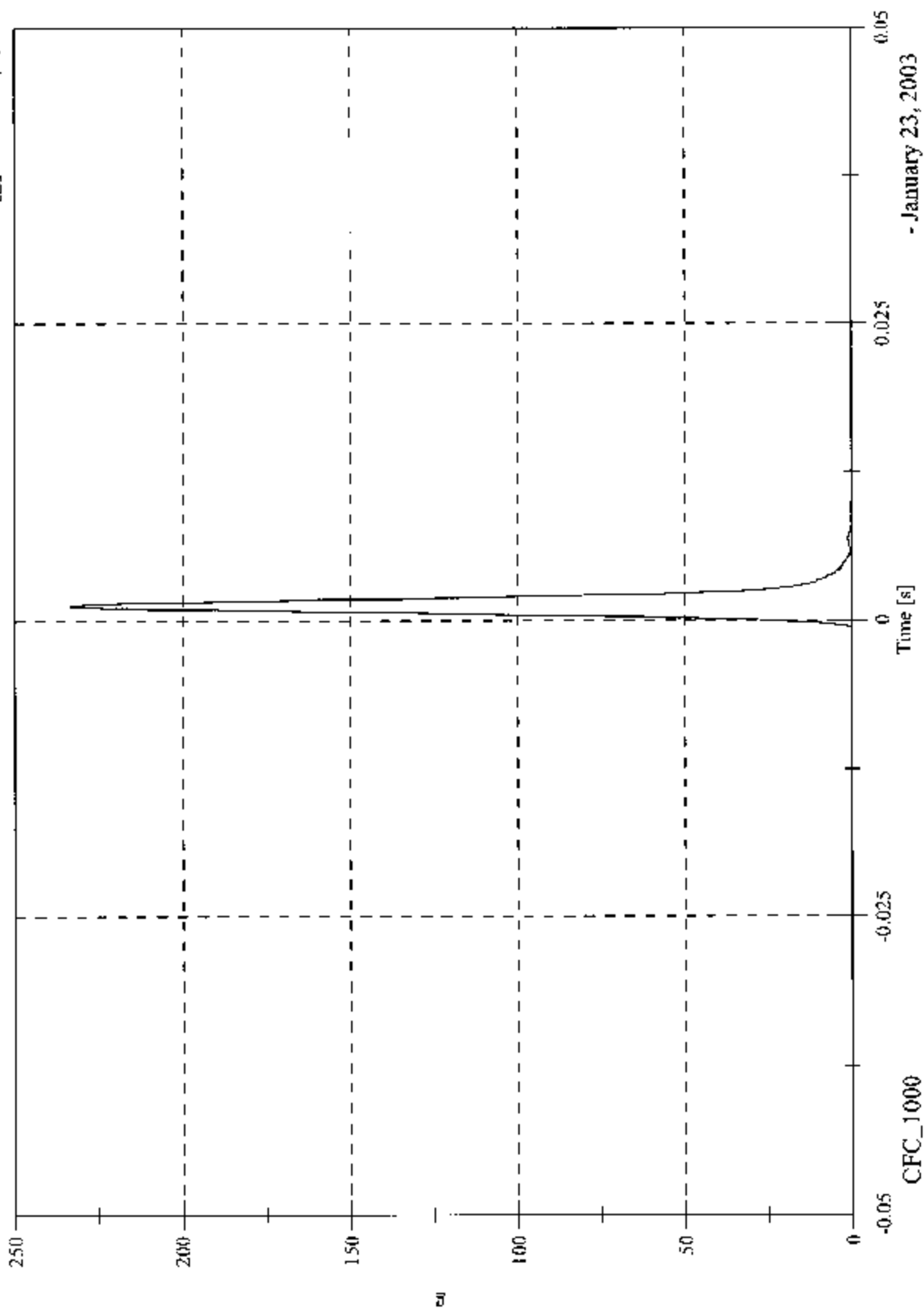


FMVSS 201U - Head Form Calibration Drops

Max: 233.4 [g] at 0.001 [s]

Min: 0.0 [g] at -0.038 [s]

Headform Resultant



- January 23, 2003

**PART 572L  
HEAD DROP POST-TEST**

|                                 |                                         |              |
|---------------------------------|-----------------------------------------|--------------|
| MANUFACTURER:                   | APPLIED SAFETY TECHNOLOGIES CORPORATION |              |
| SERIAL NUMBER:                  | 1255                                    |              |
| CALIBRATION DATE:               | January 23, 2003                        |              |
| TEST PARAMETER                  | SPECIFICATION                           | TEST RESULTS |
| TEMPERATURE                     | 19°C to 26°C                            | 21           |
| RELATIVE HUMIDITY               | 10% to 70%                              | 19           |
| PEAK RESULTANT ACCELERATION     | 225 Gs to 275 Gs                        | 268.3        |
| PEAK LATERAL ACCELERATION       | 15 Gs Maximum                           | 6.8          |
| IS ACCELERATION CURVE UNIMODAL? | YES                                     | YES          |

**HEAD ACCELEROMETER CALIBRATION INFORMATION**

| I.D. NUMBER      | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | DATE OF LAST CALIBRATION | DATE OF NEXT CALIBRATION |
|------------------|--------------|--------------|---------------|--------------------------|--------------------------|
| 1 - LONGITUDINAL | ENDEVCO      | 7264-2000T   | J41006        | 9/02                     | 3/03                     |
| 2 - LATERAL      | ENDEVCO      | 7264-2000T   | J40994        | 9/02                     | 3/03                     |
| 3 - VERTICAL     | ENDEVCO      | 7264-2000T   | J41007        | 9/02                     | 3/03                     |

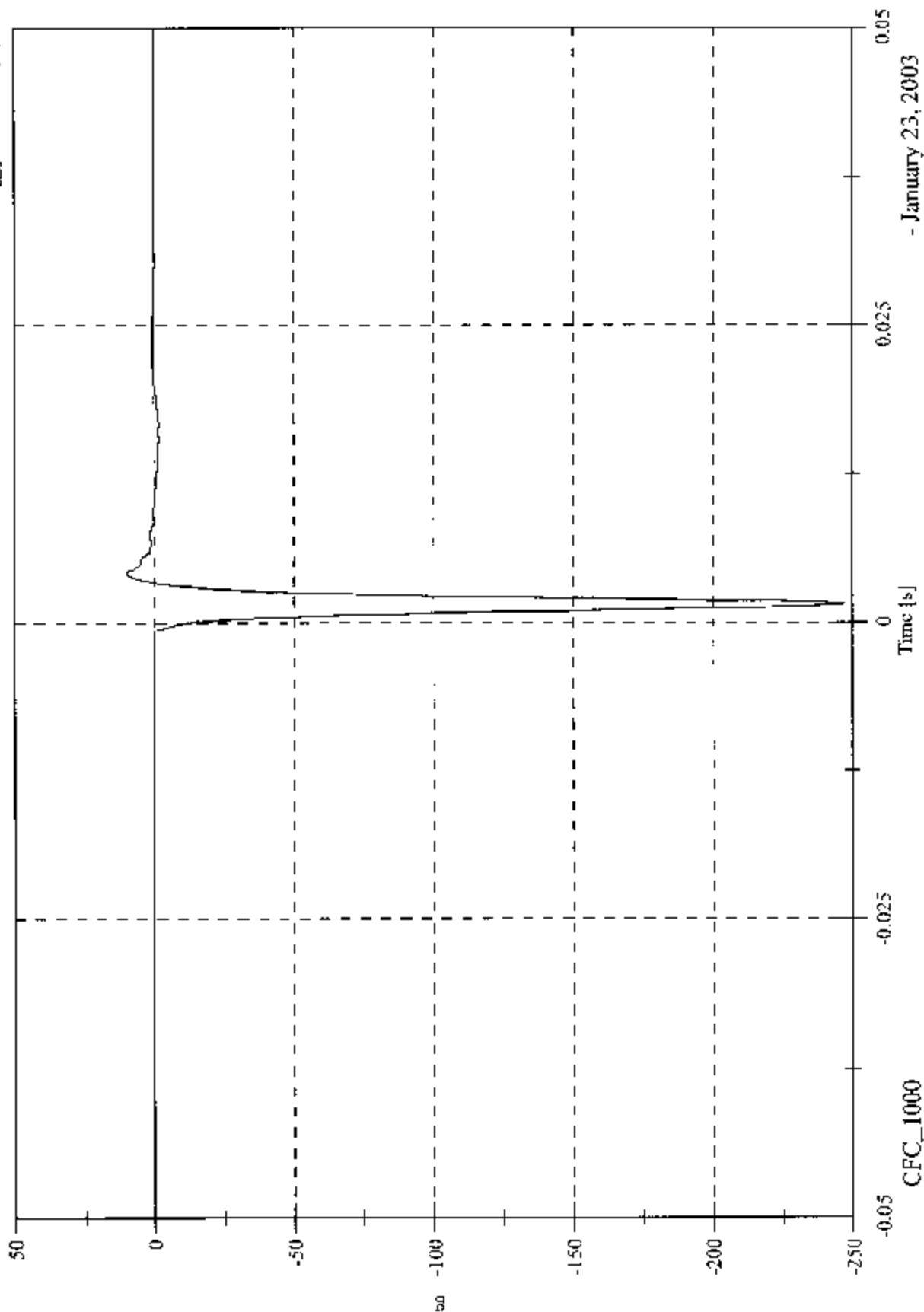
REMARKS:

FMVSS 201U - Head Form Calibration Drops

Headform X Acceleration

Max: 9.9 [g] at 0.004 [s]

Min: -246.7 [g] at 0.002 [s]

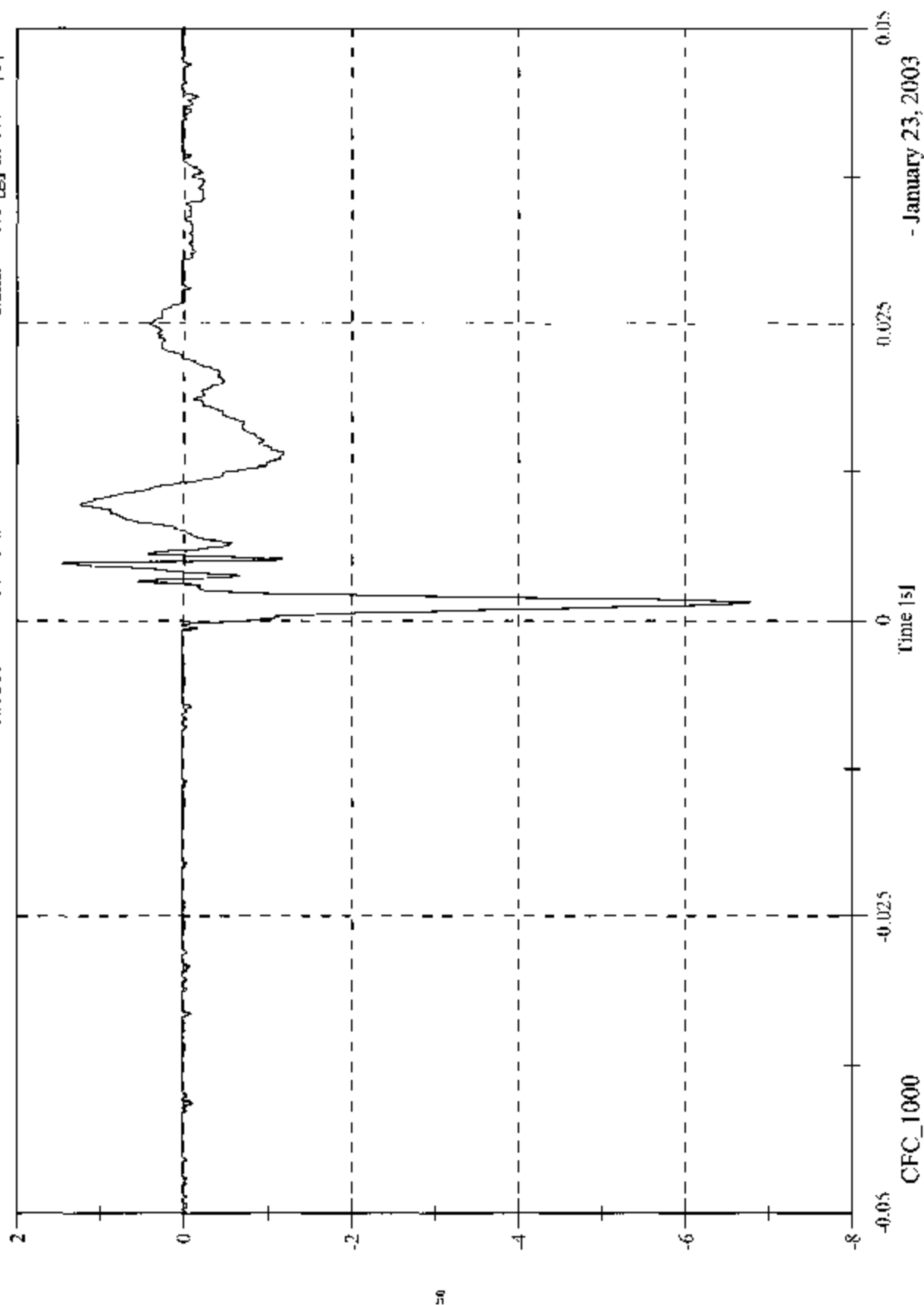


- January 23, 2003

FMVSS 201U - Head Form Calibration Drops

Max: 1.5 [g] at 0.005 [s]  
Min: -6.8 [g] at 0.001 [s]

Headform Y Acceleration

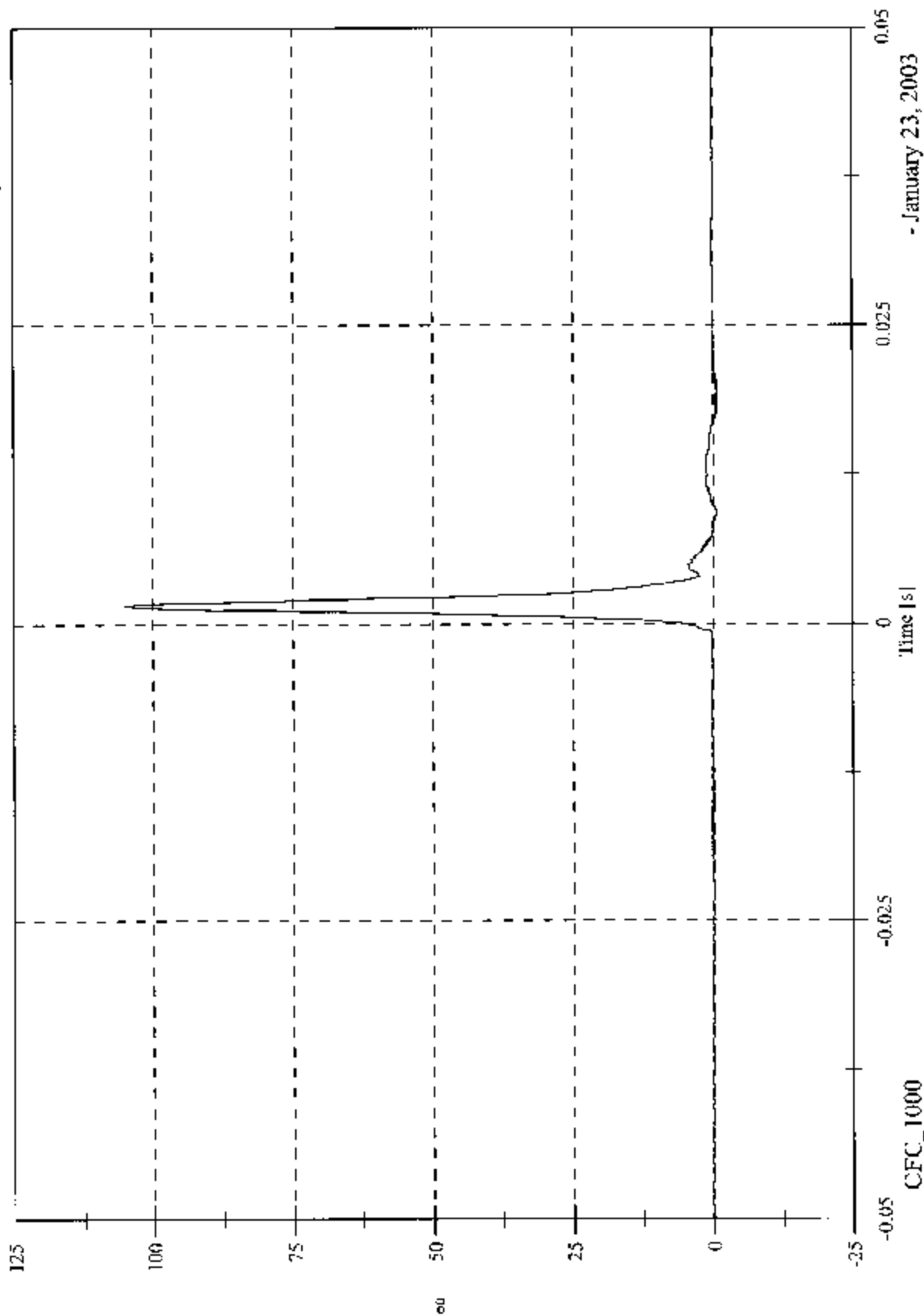




FMVSS 201U - Head Form Calibration Drops

Headform Z Acceleration

Max: 105.2 [g] at 0.002 [s]  
Min: -0.8 [g] at 0.019 [s]



- January 23, 2003

FMVSS 201U - Head Form Calibration Drops

Max: 268.3 [g] at 0.002 [s]

Min: 0.0 [g] at -0.033 [s]

Headform Resultant

